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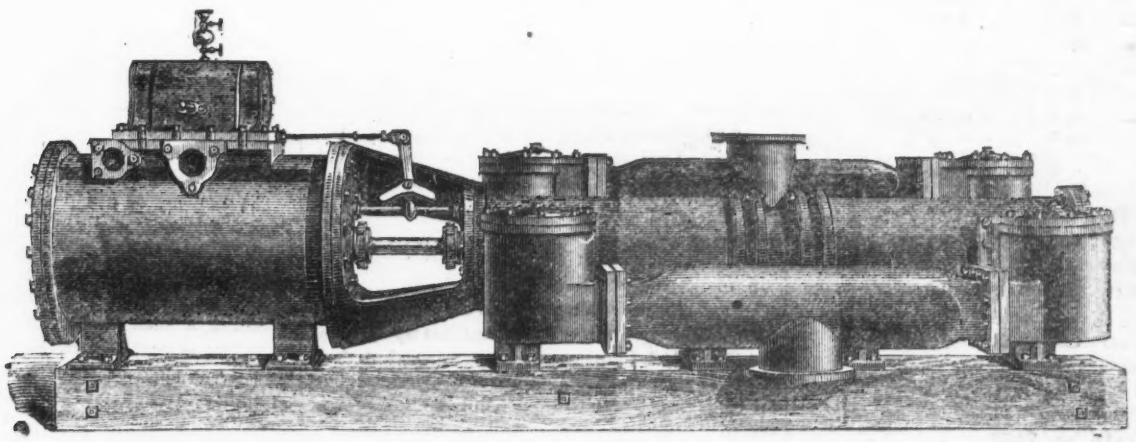
The Selden Double-Action Plunger-Pump.

Many engineers give well-founded reasons for their preference for piston-pumps, over rotary, centrifugal, and other devices; and no doubt that, for the purpose of lifting water to great heights, as is requisite in most mining operations, the propulsion of this heavy material by means of the positive movement of a piston possesses peculiar advantages, chiefly in regard to there liability of its operations.

Our readers will remember that, in a preceding number, we described the Selden direct-action steam-pump, enumerating its many advantages, and also particularly stating its especial adaptability for use in mines. We also stated that it could be placed at a distance from the engineer, and that all that was necessary to set the pump in motion was simply to turn on the steam.



THE SELDEN DOUBLE-ACTION PLUNGER PUMP.

We now present a modification of the above pump, in the adjoining handsome engraving, consisting of the same steam-end, with a plunger-pump attached. The action of this steam-end, represented at the left, is the same as that described on page 97, Vol. XII. At the right, the pump is seen, consisting of two pump-barrels, with one long plunger, common to both, and secured to the steam-piston with a steel rod, having, as usual, glands to pack that part of the plunger working through the barrel. The suction-pipe, which is common to both barrels, is seen beneath the pump, and the discharge pipe is seen above.

There is a difference which should be noticed in the manner of working the slide-valves of the steam cylinder of this pump from the arrangement employed in the pump before described. Immediately above the piston-rod will be seen a smaller rod, on which is a projection or rounded disk termed the "dog." This upper rod projects into the steam-cylinder, and also into the pump-cylinder, moving freely in and out of both; of course, in itself it is motionless. The steam-piston, on nearing the forward end of its stroke, strikes against the end of the rod which is in the cylinder, pushing it outward. The dog then impinges against the rocker immediately above it, communicating motion to the valve-rod, and so moving the slide-valve for the return stroke. As the latter reaches its end, the pump-plunger in its turn strikes against the end of the rod in the pump-cylinder; the rocker is again moved, and the slide-valves placed in position for the forward stroke.

It will be seen at once that the movement of the valves is unaffected by the length of stroke. And besides that, as long as the rocker, which is only ten inches from point to point, has space enough to work, it matters not how close the cylinders (pump and steam) be placed together. In fact, this distance need not be more than twenty-two inches for any length of stroke. Another point of advantage in this is the facility with which the motion can be reversed; a mere pressure of the finger on the end of the rocker being sufficient to alter its position, and so change that of the valves.

The dimensions of one of these pumps, recently manufactured by Mr. A. CARR, of No. 43 Cortlandt street, in this city, are as follows: Length, 14 feet 6 inches. Diameter of steam cylinder, 24 inches. Diameter of water cylinder, 13½ inches. Diameter of plunger, 12 inches; stroke, 36 inches; suction and discharge-pipes, 10 inches. Weight 7¼ tons. It will be noticed from these data that the diameter of the plunger is one inch and a half less than that of the cylinders in which it works. This suggests at once the particular efficiency of the machine where it is required to pump water containing mud or gritty substances. In the ordinary piston pump, this foreign matter rubbing and grinding between the interior of the cylinder and the piston, necessarily wears out the parts with which it comes in contact, and eventually causes them to rapidly deteriorate. In the machine in question, owing to the difference in diameter, there is clear three quarters of an inch between the exterior of the plunger and the interior of the cylinders, affording ample room for the free passage of all such substances.

MR. CHARLES HUTCHINSON informs us that, for some time past, he has used one of these pumps of the above dimensions in his coal-mine, (the Hutchinson colliery,) at Kingston, Pa. The depth of the shaft being 175 feet, a column of water of that height and ten inches in diameter, is raised by it; and running only some ten strokes per minute, it discharges some seventeen gallons per stroke. This low speed is due to the small quantity of water in the mine; as, if necessary, a velocity of forty strokes per minute can be easily obtained, when, of course, a proportionate amount of water would be raised. We learn from the same gentleman that, when starting his pump, it was covered with water; and yet, as soon as the steam was turned on, (which was done above ground at the boilers,) it started and did its work with perfect facility; the valves also worked so smoothly and easily on their seats that they made no noise whatever; a point of some interest when recalling the vast wear and tear and incessant clatter generally kept up by these parts.

One advantage of this pump, and, we might say, the principal one, is its facility of repair. It has been the object of the manufacturers to render the parts so simple that the use of the lathe and more intricate machines of the shop may be avoided; and consequently plane surfaces have been employed wherever it was in any wise practicable so to do. The simplicity of parts thus obtained, the excellence of workmanship in its every particular, render it almost superfluous for us to proceed into any more detailed enumeration of the merits of this pump; and we therefore leave to our readers interested, the demonstration to their own satisfaction of its entire adaptability for the purposes for which it was designed. These pumps are made in all sizes for any possible service.

An Oil Well on Fire.

OIL CITY, Pa., December 26.—The Cosmopolitan Well at Shrub Gross, belonging to Botsford & Co., took fire this morning by an explosion of the gas while drilling, severely burning six men, including one of the owners, Mr. BOTSFORD. The derrick was

entirely destroyed, but the fire was extinguished. The well has been flowing for several days through the casing not having been quite completed, and bids fair to be a good well. Repairs have already been commenced.

Blast Furnace Slags.*

(Continued from page 386.)

*By KENNETH ROBERTSON, E. M., Chemist to the Boonton Iron Works. A paper read before the American Institute of Mining Engineers.

From what we have seen, it is evident that it is much more economical to make a white than a grey pig iron for mill purposes. Iron for foundry use must have a certain structure, which must be attained, no matter at what expense. It is known that iron for foundries cannot be made from magnetic ore alone; the shrinkage of the iron (for an unexplained reason) in the moulds being too great. It is then useless for a furnace, where magnetic ores are used alone, to attempt to make a foundry iron. So then we have only to consider the slag for a white iron, which, we decided, might be at least a sesquibasic silicate, and possibly a proto-basic or neutral silicate. I shall give in full the method for calculating the former and merely indicate the latter.

METHOD FOR CALCULATING A SLAG.

In order to compute the requisite quantity of base to saturate the excess of silica, it will be necessary to have complete analyses of the average ores and limestones; suppose that we have three ores of the following composition:

		NO. I.	NO. II.	NO. III.
$Si O_2$	=	21.96	13.61	21.33
S	=	0.14	trace	0.18
PO_5	=	0.19	0.29	3.07
$Al_2 O_3$	=	2.92	3.96	4.00
$Fe_3 O_4$	=	64.06	80.07	65.95
$Mn^3 O^4$	=	0.41	trace	0.25
Ca O	=	4.37	1.39	3.71
Mg O	=	6.57	0.67	0.62
		100.62	99.90	99.11
Iron	=	46.39	57.98	47.76

Now we decide to use one third of each of these ores in the charge; one ton of charge so proportioned would contain:

$Si O_2$	=	18.97 per cent.
$Al_2 O_3$	=	3.29 "
Ca O	=	3.13 "
Mg O	=	2.62 "
S	=	0.11 "
$P O_5$	=	1.18 "
$Fe_3 O_4$	=	70.03 "
$Mn^3 O^4$	=	0.22 "
		99.55
Iron	=	50.70 per cent.

It was decided to calculate a sesquibasic slag, that is, a slag containing three of base to two of acid.

Alumina, to form a neutral salt, requires three atoms of acid, so for a sesquibasic salt it would take three equivalents of alumina to six of silica, and the formula would be $3 Al_2 O_3$, $6 Si O_2$ or what is the same thing, $Al_2 O^3$, $2 Si O^2$. So to determine how much silica the alumina in the ore takes, we have the following proportion:

1 equivalent $Al_2 O_2$: 2 eq. $Si O_2$ :: per cent $Al_2 O_3$: 4
51.5 : 60 :: 3.29 per ct. : 4 = 3.83 $Si O_2$
so 3.29 per cent. $Al_2 O_3$ takes up 3.83 per ct. $Si O_2$.

For the lime we have:

3 eq. Ca O : 2 eq. $Si O_2$ :: per ct. Ca O : per ct. $Si O_2$
84 : 60 :: 3.13 per ct. : 4=2.24 per ct. $Si O_2$
so 3.13 per cent. Ca O take 2.24 per cent. $Si O_2$.

For the magnesia we have:

3 eq. Mg O : 2 eq. $Si O_2$ :: per ct. Mg O : 4
60 : 80 :: 2.62 per ct. : 4= 2.62 per ct. $Si O_2$
the 2.62 per ct. Mg O take 2.62 per ct. $Si O_2$.

Hence we find that:

2.29	per cent. $Al_2 O_3$ saturates	3.83	per ct. $Si O_2$
3.13	" Ca O "	2.24	" "
2.62	" Mg O "	2.62	" "

Silica in ore saturated by bases
in ore = 8.69 per ct. $Si O_2$
which leaves 10.28 per ct. $Si O_2$ to be fluxed by the addition of limestone: this is equivalent to 230.27 lbs. of silica in the ore.

The ash of the coal must be taken into consideration: if we make an allowance of 0.8 tons coal to each ton of ore, it will be ample: assume the ash to be 7 per cent. and with the following composition:

$Si O_2$	=	4.50 per cent.
$Al_2 O_3$	=	1.50 "
Ca O	=	1.00 "
		7.00

By the same method as the preceding, we find that:

1.50 per cent. $Al_2 O_3$ take 1.75 $Si O_2$
1.00 " Ca O " 0.71 "

Silica in coal saturated by bases
in coal = 2.46 per cent.
which leaves 2.04 per cent. $Si O_2$ unsaturated in coal or 45.70 lbs. $Si O_2$ in one ton of coal: but we use only 0.8 tons coal to one ton of ore, so we have for one ton ore:

Free silica in 1 ton ore	230.27 lbs.
" " " 0.8 tons coal	36.56 "
Free $Si O_2$ with 1 ton ore	266.83 lbs.

which must be saturated by the bases in a limestone.

Suppose we have a dolomite of the following composition:

$Si O_2$	=	6.04 per cent.
$Al_2 O_3$	=	1.14 " "
Ca O	=	29.97 " "
Mg O	=	19.05 " "
$C O_2$	=	44.15 " "
		100.35 " "

By the same method of calculation, always keeping in view the formula of a sesqui basic silicate, we have:

1.14 per cent. $Al_2 O_3$ take 1.33 per cent. $Si O_2$ leaving 4.71 per cent. $Si O_2$ to be saturated. This will take exactly 4.71 per cent. Mg O to do it, so the limestone, after all silica is saturated, is represented by:

Ca O	=	29.97 per cent.
Mg O	=	14.34 " "

One of lime in forming a sesqui-basic silicate takes up 0.71 silica and one of magnesia takes up 1, silica: consequently 1.4 lime equals 1 magnesia: but there are 14.34 per cent. Mg O, which are equal to 20.08 per cent. Ca O. The entire dolomite is then equivalent to

14.34 Mg O = 20.08 per cent. Ca O
29.97 per cent. Ca O.

50.05 per cent. Ca O which is equivalent to 1121.12 lbs. free lime in a ton of stone.

There were 266.83 lbs. $Si O_2$ to be neutralized by addition of lime: then

2 eq. $Si O_2$: 3 eq. Ca O : : 266.83 : lbs. Ca O
60 : 84 : : 266.83 : 4 = 373.56 lbs.

It will then take 373.56 lbs. lime to saturate the silica from one ton of ore and 0.8 tons of coal. There were 1121.12 pounds free lime in one ton limestone: so it will take 0.33 tons limestone to the ton of ore to make a sesqui-basic silicate. The ore contained 50.70 per cent. iron, which we may call 50 per cent.: so we then will use 0.66 tons limestone to 1 ton of pig made. This would give a slag of the following composition:

SESQUIBASIC SLAG.

		Coal and Ore. lbs.		Stone. lbs.		Total. lbs.	Per cent.
$Si O_2$	=	504.56	+	44.64	=	549.20	= 47.05
$Al_2 O_3$	=	100.58	+	8.43	=	109.01	= 9.34
Ca O	=	88.03	+	221.54	=	309.57	= 26.51
Mg O	=	58.69	+	140.82	=	199.51	= 17.10
						1167.29	100.00

FORMULA.

$(R_2 O_3, 2 Si O_2) + (10 R O, 7 Si O_2)$ which is as nearly a sesquibasic silicate as can be calculated, using but two places of decimals; the correct formula would be $(R_2 O_3, 2 Si O_2) + (9 R O, 6 Si O_2)$

With this limestone and mixture of ores we would use 0.33 tons limestone to 1 ton ore (0.66 tons stone to 1 ton pig) and have 1167.29 lbs. slag with one ton ore, or 2334.58 lbs. to one ton pig for a sesquibasic slag.

Using the same ores and limestone, and allowing one equivalent of base to one of acid, so as to get a neutral slag, we have 0.11 tons limestone to the ton of ore, or 0.22 tons stone to 1 ton pig. The slag formed will have the following composition:

NEUTRAL SLAG.

		lbs.		per cent.
$Si O_2$	=	519.44	=	58.34
$Al_2 O_3$	=	103.39	=	11.61
Ca O	=	161.88	=	18.18
Mg O	=	105.63	=	11.87
		890.34		100.00

FORMULA.

$R_2 O_3, 3 Si O_2 + 5 (RO, Si O_2)$

This is equivalent to 1780.68 lbs. slag and 0.22 tons limestone to 1 ton pig.

By the same method of calculation, we find that by giving two of base to one of acid, we have a bi-basic slag of the following composition:

BI-BASIC SLAG.

		lbs.		per cent.
$Si O_2$	=	584.04	=	39.38
$Al_2 O_3$	=	115.39	=	7.78
Ca O	=	477.40	=	32.19
Mg O	=	306.19	=	20.65
		1483.02		100.00

FORMULA.

$(2 R_2 O_3, 3 Si O_2) + 15 (2 RO, Si O_2)$

Resumé.

NEUTRAL SLAG.

1780.68 lbs. slag and 0.22 tons limestone to 1 ton pig.

SESQUI-BASIC SLAG.

2334.58 lbs. slag and 0.66 tons limestone to 1 ton pig.

BI-BASIC SLAG.

2966.04 lbs. slag and 1.16 tons limestone to 1 ton pig.

The economy of using one or the other of these slags is evident at a glance: the only question open being the advisability of having as highly a siliceous slag as the neutral one, but this can only be proved by direct experiment. The chances are that it would answer in a small furnace where the ore would not be so long in contact with the coal and the chance of reduction of silica be diminished, provided the furnace worked rapidly, with a large volume and low pressure of blast.

Although it may be extraordinary, in this country, for a slag to contain 58 per cent. silica, yet in Percy's Metallurgy of Iron and Steel, page 502, we find analyses of slags from coke furnaces containing 53 per cent. silica, and those from charcoal furnaces with as high as 70 per cent. silica. The slags from furnaces using charcoal as a fuel must be more fusible than using coke or anthracite and consequently they are more siliceous. Because anthracite is a better fuel than charcoal is that a sufficient reason for giving it more work to do?"

The saving to be made in limestone, fuel and labor is sufficient, I think, to warrant an effort being made to determine whether or not it is practicable. As far as economy of material, it is certain, there would be no injury to a furnace and the only question is the quantity of silicon, which would enter the pig. But with proper precautions this could not effect much damage, for the charge could be changed by degrees and the slag and iron watched from day to day.

Till within a few years it was considered disadvantageous to use a dolomitic limestone as a flux, and even now among many furnace managers they are considered inferior to those containing only carbonate of lime. From what this prejudice originated, I am at a loss to say: probably, in some cases, from the idea that the magnesia in it rendered the slag infusible, but in others that I know of, from the belief

that the lime alone played any part in the fluxing of the silica; and so the stone was judged from the amount of lime it contained, which, of course, is less than in a calcitic stone. It is known that substances, which by themselves are infusible or difficultly so, often, by the addition of other substances, become more fusible. For instance, the alloys of some of the metals ex. gr.: Bismuth melts at 270° C.; Lead at 322° C.; and Tin at 228° C.; but an alloy (D'Arcet's) of: Bismuth 8, Lead 5, Tin 3 parts by weight, melts at 96° C.: and what is more, this combination corresponds to the chemical formula Bi_3, Pb_2, Sn; which is an argument for having a slag of an exact chemical composition.

So, although a silicate of lime is more fusible than a silicate of magnesia, yet a mixture of the two is more easily melted than either of them alone. Then the objection of want of fusibility is disposed of. Iron masters appear irrational and inconsequent on the subject: how many of them are glad to get an argillaceous ore to mix with their silicious ores, and yet what is more infusible, "per se," than a silicate of alumina. But when there is a compound formed containing silicates of alumina, lime and magnesia, it is far more fusible than either of them alone. The other cause of difference in the general valuation of the stone, viz.: the idea that the magnesia does not carry off any silica, is one which is hardly worth noticing, further than to make the following statement:

1 lb. Al_2O_3 takes 1.74 lbs. $Si O_2$
1 lb. Ca O " 1.07 " "
1 lb Mg O " 1.50 " "

The above is for a neutral slag, the relative proportions of silica saturated will be kept in any other slag. From which can be seen the comparative saturating power of these bases for silica. Having the analyses of two limestones their relative value can be determined.

No. I.			No. II.		
$Si O_2$	=	6 04	$Si O_2$	=	7.55
$Al_2 C_3$	=	1.14	$Al_2 O_3$	=	2.33
Ca O	=	29.97	Ca O	=	48.19
Mg O	=	19.05	Mg O	=	1.46
$C O_2$	=	44.15	$C O_2$	=	39.47
		100.30	H O	=	1.00
					100.00

For No. I. we find that 1.14 $Al_2 O_3$ take 1.99 $Si O_2$, which leaves 4.05 per cent. $Si O_2$ free. The Mg O equals 26.67 Ca O since 1 Mg O equals 1.4 Ca O: consequently the stone is equivalent to 56.64 per cent. Ca O with 4.05 free $Si O_2$ in it. This 4.05 per cent. $Si O_2$ takes 3.78 per cent. Ca O, so there are 52.86 per cent. free Ca O in No. I.

For No. II. we find that 2.33 per cent. $Al_2 O_3$ take 4.07 per cent. $Si O_2$. This 4.07 per cent. $Si O_2$ require 3.79 per cent. Ca O. There are 1.46 per cent. Mg O, which is equivalent to 2.04 per cent. Ca O. The stone is then the same as:

Ca O = 48.19
Ca O = 2.04
Ca O = 50.23
Ca O = 3.79 taken by silica.
46.44 per cent. Ca O,

which is the value of the limestone:

No. I. contains 52.86 per cent. free Ca O.
No. II. " 46.44 " " " "

Since limestone is used for a flux, that stone which contains the greatest proportion of fluxing material would be the best: and when two stones contain unequal amounts, their value ought to be in direct proportion with their per centages of base. Some furnace managers deny this, but when this statement is accompanied by the declaration that a dolomite with serpentine as a gangue (which serpentine is charged into the furnace with the stone) answers as well as either a good dolomite or calcite, the statement is so irrational that we are compelled to doubt their ability to decide, and accept their dictum for what it is worth.

The economy, with which pig iron can be made, depends, in a great measure, upon the material consumed in making it. This can only be regulated by continual watching of the ores and limestones, and apportioning each with a view of producing a certain result, both in iron and slag. The ore is almost certain to vary, and although it may require a certain proportion of limestone one month, it does not follow that the same will answer for the next month. The irrationality with which charges are frequently made is shown by the two examples given previously: this same waste is likely to occur at any furnace where a close watch is not kept on all material and some degree of reason exercised in regulating the proportion of ore and limestone. This can not be done until American iron masters consent to follow the example of their European brothers, and call in the aid of those sciences which relate to their industry; until which time, it will be a question open to dispute, whether it is the cost of labor alone, which forces the manufacturers of America to have a high tariff in order to enable their products to compete with those of Europe.

N. B.—The calculations of slags have been made upon the assertion of Fresenius that the formula of silicic acid is $Si O_2$ and the equivalent of silicon 14.0.

Utilization of Coal Dust.

HALL OF THE FRANKLIN INSTITUTE,
PHILADELPHIA, Dec. 19, 1871.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, to whom were referred for examination specimens of artificial fuel, prepared by Mr. E. F. Loiseau, of Philadelphia, report that they have made trials of the samples produced from anthracite and from bituminous coal.

The mode of manufacture, as related by Mr. Loiseau, is as follows:

1st. Anthracite small coal and dust were mixed with seven (7) per cent. of clay, and compressed into cylindrical moulds about 4½ inches in diameter and 4 inches deep, or else into spherical masses, about 3 inches in diameter.

2d. The moulded masses are placed for a few minutes in a bath of benzine, in which rosin has been dissolved, and from which they are removed and dried by an exposure to a current of air.

The object of coating them with a film of rosin is to prevent the absorption of moisture and consequent softening of the clay; the solution in benzine penetrates the mass of coal and clay to a depth of about ½ of an inch, and so efficiently closes the crevices that samples immersed in water for twelve hours were found dry in the interior when broken up for examination.

Both the anthracite and bituminous fuels were burned in a furnace measuring nine inches in diameter and seven inches in depth, each variety of fuel burned freely, and was completely ashed, but the intensity of the combustion was less than that produced by anthracite or bituminous coals of small size burned in the same furnace.

These comparisons were made with a moderate and also with a strong draft.

The average amount of ash obtained from the anthracite artificial fuel was 16 per cent., and from the bituminous artificial fuel 18.5 per cent.*

The heating powers, as obtained from trials in Thompson's apparatus, are as follows:

One pound of anthraoite artificial fuel evaporated	4.30	lbs. of water.
" "	8.50	" "
" "	7.86	" "
" "	6.76	" "
An average of	6.85	" "

* The percentage of ash is larger than in ordinary coal, as the clay is not consumed; but the other advantages of the artificial fuel in point of durability, cleanliness and cheapness more than compensate this small disadvantage.

One pound of bituminous artificial fuel evaporated	9.35	lbs. of water.
" "	11.11	" "
" "	12.88	" "
" "	10.61	" "
An average of	10.99	" "

The anthracite average is 7.40 lbs. of water.
The average of bituminous is 14.88 lbs of water.

The non-uniformity of result is partly due to the imperfect manipulation in mixing the coal and the clay, and partly to the varying amounts of solution of rosin absorbed in the bath to which the material is subjected. The imperfect manipulation can be remedied by the adoption of proper machinery for that part of the process.

The ability of the artificial fuel to bear transportation is less than that of anthracite, or good lump bituminous coals, but the structure is firmer than that of many bituminous and semi-bituminous coals that are carried to market. The masses will generally break up with a fall of three feet upon a stone pavement, but are strong enough to bear ordinary handling and transportation, and should they become broken would suffer no damage unless exposed to wet.†

The samples of artificial fuel examined are well adapted for use for purposes in which great intensity of combustion is not desired.

For the production of steam in stationary boilers, and for household purposes, it can be employed equally as well as any ordinary coal; and whenever the cost of preparation is less than the cost of mining coal, this invention will make available the immense amounts of small coal now allowed to remain useless at the coal mines. It appears to work far better than the balls or bricks of coal dust and clay and lime that came into vogue in this city many years ago, when anthracite was brought to market without preparation by the coal breaker, which had not then been invented, the balls or bricks thus made not having the protection from wet secured by Mr. Loiseau by his resinous coating.‡

We consider the method of preparing artificial fuel from waste anthracite and bituminous coals, as presented by Mr. E. F. Loiseau, as ingenious and well adapted to the purpose, and worthy of the attention of those interested in the production of a cheap fuel, adapted to a great variety of uses.

Respectfully submitted. Signed,

CHARLES W. CRESSON,
WILLIAM H. WAHL,
JOHN WISE,
Sub-Committee.

† The samples of artificial fuel presented to the Franklin Institute to experiment upon were simply compressed by hand, and could not be made as solid as they will be when compressed by appropriate machinery.

‡ The cost of manufacture, at the mines, including the coal and all the materials, will not exceed $1 per ton.

Technical Education in the Bessemer Process.

By RICHARD H. TERHUNE, E. M.

Regarding this as a promising and interesting field, many of the graduates of the technical schools have sought positions in this department, but without knowing the difficulties to be overcome, or the true way to begin. It is very generally believed that there exists, or will exist, a great demand for such young men in this branch, and when the course of study shall have been supplemented by considerable practice, there will be little difficulty in securing employment.

This practice, so necessery to success, and without which the confidence of employers cannot be gained, must be acquired at the expense of the student; men will not pay to educate, although the permission to be engaged about the works, no small favor in itself, has generally been granted. With many, this initiatory duty is too uncongenial; a spurious pride often prevents the transition from the lecture room to the converting room, the exchange of the delicate operations of chemical analysis for the rougher duties of steel manufacture, being regarded with mingled dread and disgust. Thus, insufficient means

on the one hand, and false notions concerning the compromise of dignity on the other, exclude many from the attempt.

When the *extent* of the industry in our country is considered, the prospect becomes less alluring. Of the seven Bessemer works in the United States in operation and in course of construction, there is but *one* without its organized, working force. The erection of new works is at present quite rare, and each establishment of the kind affords at best only three or four desirable positions. As in banks or other close corporations, if the force of officials is effective, and they are constantly becoming more so, changes are very infrequent, and in case of an enlargement of production, necessitating additional men, it is usual to draw them from the other departments, or the same department, and very properly young men of merit receive promotion.

When works are in running order, and metallurgical formulæ arrived at, it is possible for purely practical men to produce a good article, to shape it into form for use in the arts, and to empirically test its strength. Almost anyone can learn to detect the falling flame in the last stage of the converting process, and to perform the mechanical duties of a steel "blower," but it must be borne in mind that established works are often susceptible of important modifications, which may be dictated by experience or otherwise—evidently a work for the intelligent engineer.

Again, the lack of homogeneity of given irons, and the variable composition of different irons, together with a list of subtle influences, many indeed inexplicable, which affect the wonderfully sensitive product, are all conditions which only the skillful metallurgist can properly treat. The problems in chemistry, physics and mechanics upon which the process depends for its perfection, are numerous and difficult, and devolve upon educated men; and it is by allying with practical experience even a thorough knowledge of the theory of combustion of refractory materials, and the chemical distinction between a hot and cold working iron in the converter, that a combination is secured which cannot but prove salutary, and one which will exemplify the perfect harmony of *complete* theories and practice. It is said it takes a great while to learn to be a skilful puddler; longer possibly than it would take to learn the theory of the process; but the puddlers will not study, and the educated men will not perform manual work, and hence there is a division where there should be perfect union. Much of the indifference of owners is undoubtedly due to the unwillingness of students to establish their merit by a year or two of probation. American professional men forget that schools are only places of preparation, and expect unlimited confidence and munificent salaries as soon as they leave the college portal. Practice is the true sequel to study, and should always follow, not precede it. There is a wholesome inspiration derived from foregoing study. The mind is directed into peculiar channels of thought, and the attainment of good results is facilitated by a knowledge of these elementary principles, upon which the most abstruse problems in the material world depend for their solution.

Scientific Notes.

At the meeting of the Polytechnic Association, held December 15th, the PRESIDENT read the following scientific notes:

I—CARBONATE OF SODA.

A new process for the production of carbonate of soda has been invented by M. Swager. By the joint aid of highly super-heated steam and red heat he decomposes the double chloride of aluminum and sodium, previously fused, thus forming aluminate of soda and hydrochloric acid. The latter is condensed; the former, heated with carbonic acid, yields carbonate of soda and alumina.

II—RED PHOSPHORUS AN ABSORBENT.

It is stated by Mr. Testini that the red variety of phosphorus has the power of absorbing many substances without acting chemically upon them. For example, this phosphorus when powdered, is poured into a violet-colored solution of iodine in bisulphate of carbon, and, on agitation, the solution will become colorless, if a sufficient quantity of phosphorus is present, thus showing that the iodine has been absorbed. Sulphur, rosanaline and other substances have been absorbed in small quantities by red phosphorus.

III—ANTIDOTE TO PHOSPHORUS.

Messrs. Eulenberg and Vohl have shown that phosphorus is so readily absorbed by carbon that, taken in the form of pills, carbon constitutes a complete antidote. The pills are made of animal charcoal, powdered and mixed with a little gum. In match factories these pills are found to relieve operatives who have been poisoned by phosphorus, and to be a much better remedy than that proposed by M. Personne, the essence of terebenthine having been found to produce violent headaches by continued use.

Mr. T. D. STETSON—It may be interesting in this connection to call attention to the effect of charcoal upon human and animal physiology. A good deal depends upon its being fresh. If taken into the stomach in a fresh condition, it tends to correct acidity, and to vitalize and invigorate, although scientists may be puzzled to explain exactly why. The most plausible theory is that it promotes slow combustion, making the partially-decayed matter burn up and leave nothing but fresh. If a piece of meat is packed in fresh charcoal, and occasionally repacked, it will be all gone at last, but it will remain fresh. Charcoal will even restore meat partially decayed. Meat that has been overlooked until it is quite offensive, by washing and packing in charcoal is restored. Used in the mouth, some authors say it tends to prevent decay of the teeth. A considerably large piece, held in the mouth, once in a few days or even weeks, will keep the breath sweet, and tend to preserve the teeth.

Dr. SHEPARD—I read many years ago an account of a man who was in the habit of taking a great deal of charcoal; and after his death, it was found packed in his intestines in lumps. I have preferred, when charcoal was needed, to take flour and char it; flour being more easily digested. I have sometimes found it useful to mix with it one-fourth part of uncharred flour, in order to give some nourishment also. It requires to be fresh, because it absorbs so much from the atmosphere.

Dr. FEUCHTWANGER—Carbon acts merely as an absorbent. It acts mechanically,

The PRESIDENT—It is well known that carbon absorbs many times its own volume of gases. Whether it will absorb them when it is wet in the mouth is rather doubtful. The use of charcoal, in a case of flatulency, will sometimes give entire relief. I hardly think it remains in the stomach undigested. A lady in Jersey City continued for years to use as much as 12 cubic inches daily.

Dr. SHEPARD.—The system has no power to assimilate it. It does not remain in the stomach, but it is liable to catch in the folds of the intestines.

Dr. RICHARDS.—After charcoal has absorbed its full amount of gas, it will absorb about the same quantity of other gases. I have stopped the decay of a tooth by whittling a plug of charcoal and putting it in. Charcoal undoubtedly tends to prevent flatulence; but I think it is not from its power of absorption. Like mustard, it probably stimulates the stomach.

Mr. STETSON.—Charcoal has been fed to cattle, mingled with meal, with good effect, for many years. The theory of decay is that one particle starts another. Charcoal promotes *eremacausis*, or slow combustion; and the moment a particle begins to decay, it resolves it into gases and leaves the rest sweet.

Dr. RICHARDS.—Carbon is perfectly indigestible. In the lungs of miners, it accumulates so as sometimes to destroy life; showing that it is indestructible in the system.

IV.—MELLITHIC ACID.

Prof. SCHULTZE recently made an announcement at a recent meeting of a German Association, which was received with enthusiasm, it being regarded as a pioneer research in a new field, which is likely to be of great importance in applied chemistry. He has succeeded in obtaining mellithic acid by the direct oxidation of carbon with permanganic acid in alkaline solution. Oxalic and other acids had been also produced previously by the same process. Mellithic acid was obtained from various forms of carbon, including graphite, which on distillation with soda-lime gave benzol, and the latter upon nitralion and subsequent reduction yielded aniline.

TO BE CONTINUED.

The Coal Outlook.

The fear of a general suspension of mining operations, which has very generally prevailed during the past few weeks, seems to have to a great degree subsided. It is even denied in some quarters that there was any grounds for this fear at all, but it is a well-known fact that three of the large companies working in the Wyoming district had made definite arrangements to reduce the wages of the operatives in their employ, and it is quite certain that a strike would have been declared had these arrangements been carried into effect. The miners are now working under an agreement which expires at the end of the year, and it is quite probable that the companies will then propose a basis more favorable to themselves, and if a reduction is insisted upon there is every reason to believe that the miners will quit work. It is claimed on the part of the companies, however, that rumors of a reduction are unfounded, and that, so far as they are concerned, the coming year will be one of uninterrupted peace and prosperity. These rumors and counter rumors may be taken for what they are worth. The future of the coal trade is, as usual, dependent on several contingencies, none of which can be made the basis of any definite calculation; but the outlook seems to be generally favorable, and if no new disturbing elements are added, the relations between the miners and the operators during the coming year will probably be quite as harmonious as heretofore, if not more so.—*Iron Age.*

Rothwell's Map of the Wyoming Valley.

We desire to direct the special attention of our readers to the advertisement of a large and accurately drawn map of the great anthracite coal basin, which will be found elsewhere. The Scientific Publishing Company have secured the agency for the sale of this map, which is now for the first time offered to the public for subscription. Its value is fully shown by the liberality with which the large companies have subscribed to it.

A New Flying Machine.

A recent monthly meeting of the Franklin Institute was enlivened by a description and exhibition of a model of an aerial ship, the invention of Mr. Judson, a Philadelphia machinist. The new flying machine consisted of a cigar-shaped balloon float made of oiled silk and intended to be inflated with hydrogen gas. Beneath the float and running its entire length is a beam, beneath which runs a pipe conveying compressed air from a large copper receiver, made sufficiently strong to withstand a pressure of one hundred pounds to the square inch, to a pair of cylinders in front, the piston of which gives motion to a large cog wheel which furnishes the motive power of the machine. Crossing the cylinders is a frame work supporting shafting and spur wheels which drive the fans, four on each side, thus propelling the machine through the air. Beneath the float is suspended an enclosed car for the operator and passengers. The float, when inflated, is calculated to last for twenty-four hours. The model works well, and the plan seems practical, and was generally received as the most feasible method yet advanced for navigating the air.

THE COAL TRADE.

Anthracite Coals.

NEW YORK, Dec. 29, 1871.

WHOLESALE.—There is but little change to note this week in the general tone of the market, though prices of all kinds of coal, except lump and steamboat, show a decline.

The great event of the week was the Scranton auction sale, which took place at noon on Wednesday. One hundred and twenty thousand tons of Scranton coal were disposed of, viz.: 10,000 tons of lump, 10,000 tons of steamboat, 18,000 tons of grate, 17,000 tons of egg, 50,000 tons of stove, and 15,000 tons of chestnut. Lump sold at an average of $3 45, an advance of about six cents per ton over last month's auction sale; steamboat sold at an average of $3 95⅝, an advance of 32½ cents per ton over last month; grate at an average of $4 12½, a decline of 2½ cents per ton over last month; egg at $4 11, a decline of 16½ cents per ton; stove at $4 88, a decline of 28½ cents per ton; and chestnut at $3 96, an average decline of six cents per ton as compared with the November sale.

A large number of dealers were in attendance and the bidding was quite spirited.

The following is a comparison of the highest and lowest prices, with those at the last sale in November:

	Dec. 27.	Nov. 29.
Lump	$3 42½ a $3 47½	$2 35 a $3 50
Steamboat	3 92½ a 4 00	3 57½ a 3 72½
Grate	4 00 a 4 05	4 12½ a 4 15
Egg	4 05 a 4 17½	4 27½ a —
Stove	4 77½ a 5 00	5 07½ a 5 10
Chestnut	3 87½ a 4 05	— a —

At a meeting of the Lehigh Coal Exchange, held at noon yesterday, to determine the prices of the ensuing month, the following circular waas issued:

NEW YORK LEHIGH COAL EXCHANGE.

NEW YORK, Dec. 28, 1871.

At a meeting held this day, the following prices were adopted for January shipments at Elizabethport, Port Johnson, and Hoboken:

Lump	$5 00
Broken	4 75
Egg	4 50
Stove	5 25
Chestnut	4 25

E. BELKNAP, Secretary.

The demand for Lehigh coal continues moderate, and about one-half of the coal produced when the mines are being worked at their maximum capacity is coming to market.

Fears regarding a strike in the coal regions have almost disappeared. In the Lehigh region there is scarcely any possibility of such an event, and in fact it is difficult to conceive how the miners could inaugurate another strike before Spring with any chance of success, since their last year's suspension continued for so long a time and threw them so much behindhand. The terms at which they resumed work were agreed upon, between the companies and the men, for a year from the date of the resumption which occurred in May, so that the companies cannot well demand a reduction before that time

The prices of the Wilkesbarre coal will be fixed by a circular to be issued on Tuesday, Jan. 2d, and they will be given in our next.

BITUMINOUS COAL.—The condition of this branch of the trade is truly remarkable, and though we have frequently called attention to it, we cannot refrain from doing so again. The Cumberland coal of the Consolidation Coal Company, for example, is in excellent demand at high rates. This fact speaks more loudly for the excellence of these coals for steam purposes, than anything that could be written or scientifically demonstrated regarding them. We quote them, as will be seen, at an advance of seventy-five cents per ton over our previous quotation at New York. They now bring $7 50 per ton, on board. The decline in anthracite coal does not at all affect the prices, and the dullness of trade does not influence the demand. If in the face of a falling market they continue to advance in price, the question naturally arises: "What would they have brought had anthracite coal not declined?"

FREIGHTS.—Freights have advanced considerably, as will be seen by a comparison of our tables this week with those of last. To Eastern ports which are still open vessels can be had at from $3 to $3 25 per ton from New York; to Bridgeport, $1 10, and New Haven, $1 10.

Railroad tolls from Mauch Chunk to tide water are also changed.

The river at Georgetown being completely frozen over, no shipment of Cumberland coals can be made from that point. Harbor freights we quote at from 50 to 60 cents per ton.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Dec. 23, 1871, compared with the week ending Dec. 24, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R†	....	2,984,263	....	3,659,436
*Schuylkill Canal	....	560,665	....	1,010,171
*Lehigh Valley R. R.	....	2,810,020	....	2,210,272
Lehigh & Sus. R. R.	28,747	1,065,889	33,184	1,300,754
Lehigh Canal	....	781,289	....	740,636
Scranton North	1,117	668,034	9,823	545,178
" South	341	1,677,682	44,269	1,302,186
Penn. Coal Co., rail	427	1,069,296	17,067	768,649
" " " canal	....	16,603	....	13,962
Del. & Hud. Canal Co.	....	1,292,675	....	991,825
" " East	7,689	447,741	8,217	342,309
" " West	5,502	86,748	1,362	113,551
South	4,433	423,555	4,998	331,588
Shamokin	10,148	484,256	8,030	622,853
Trevorton	....	67,371	....	....
Lykens Valley Coal Co.	....	67,774	....	91,074
Wyoming South	....	326,645	....	....
Wyoming North	....	....	....	4,167
P. N. Y. C. & R. R. Co.	....	276,151	....	104,987
Williamstown Col'y	3,955	293,796	....	....
Big Lick Col	....	88,890	....	142,485
Total	60,359	15,489,461	125,950	14,306,074
1870	....	14,306,074	60,359	....
Decrease	....	1,183,387	....	....
Increase	....	....	....	65,591

* These figures are for the week and fiscal period ending Nov. 30. See tables below for tonnage since Dec. 1.

† Less coal transported for Co's use and Bituminous coal.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Dec. 23, 1871, compared with week ending Dec. 24, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
C. & O. Canal	....	520,107	....	653,420
B. & O. R. R.	17,816	882,298	22,603	1,213,604
H. & B. T. R. R.	6,223	308,169	4,250	315,064
*Harrisburg & D.	....	680,791	....	742,424
*L. V. R. R.	....	13,847	....	355,096
P. & N.Y.C. & R. Co.	....	239,660	....	194,253
Cumberl'd Branch Canal	....	84,253	....	71,189
" Railroad	524	112,512	387	....
Total	24,363	2,841,727	27,240	3,545,050
			24,563	2,841,727
Decrease				
Increase			2,877	703,323

The tonnage of the P. & N. Y. C. & R. R. Co. is included in that of the L. V. R..R. Co.

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending Dec. 23—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1871., tons ct	WEEK 1870. tons ct.	YEAR 1871 tons cwt.	YEAR 1870, tons. cwt.
Wyoming Region	21346 00	15580 06	1278612 09	1231276 12
Upper Lehigh Region	3174 12	3758 04	107871 04	154650 10
Beaver Meadow Region				
Hazleton Region	4177 10	359 05	217070 06	319031 18
Mahanoy Region				
Tresckow Region	2378 01		81865 13	
Mauch Chunk Region	5554 17	10406 05	238163 02	148009 02
Totals	36631 00	30104 00	1923582 14	1852367 02
Increase	6527 00		71215 12	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	33183 16	28747 05	1300713 11	1065688 11
Forwarded East of Mch Chunk by Canal		1755 13	420246 13	529036 09
Delivered at and above Mauch Chunk	1687 00		69372 01	48308 09
Delivered to L. & B. R. R.at PlymouthBridge	935 15		103766 18	184266 17
L. V. R. R at Packer'n	824 09	201 02	19503 11	24866 16
Totals	36631 00	30104 00	1923582 14	1852367 02
Of the above there was transported on acc'nt of L. C. & I. Co	6912 16	12785 11	348468 19	203827 15
W.-B. C. & I. Co	16845 02	11446 08	854095 06	632703 16
Totals	22947 18	24231 19	1202564 05	836531 11
Increase			365932 14	
Decrease	1284 01			

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, Dec. 23, 1871.

	Tons. Cwt.
From Port Carbon	— —
" Pottsville	— —
" Schuylkill Haven	625 11
" Port Clinton	— —
Total for week	625 11
Previously this year	10,378 12
Total	11,004 03
To same time last year	36,225 17

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Dec. 23, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	17,067 06	768,649 10	427 09	1,069,295 16
" Canal	.....	13,962 04		16,602 18
Total	17,067 06	782,611 14	427 09	1,085,898 14
Decrease 1871, 303,287 00				

Shamokin Coal Trade.

For week ending December 23, 1871	8,029 11
Same time last year	10,148 07
Increase	
Decrease	2,118 16
Total amount shipped to date	622,853 08
Same time last year	484,256 01
Increase	138,597 07
Decrease	

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, December 23, 1871.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	31,125	00
" Port Carbon	3,681	15
" Pottsville	220	11
" Schuylkill Haven	4,087	12
" Pine Grove	1,057	13
" Tamaqua	8,330	10
" Harrisburg		
" Dauphin	1 124	13
Total	48,817	15

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	.....
" Mill Creek "	.....
" Schuylkill Valley Scales	.....
" Mt. Carbon "	345 05
" Oressona "	.....
" Pine Grove "	.....
" Tamaqua "	.....
Total	345 05

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	590 03
" Shamokin	2,736 06
" Herndon	.....
Total	3,326 09

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	892 15
" Lebanon & Pine Grove Branch	1,117 14
Total	2,010 09

CONSUMED ON LATERALS.

From Frackville Scales	697 02
" Mill Creek "	460 17
" Schuylkill Valley Scales	89 03
" Mt. Carbon "	174 03
" Oressona "	321 19
" Pine Grove "	330 15
" Tamaqua "	433 09
Total	2,507 08

LEHIGH AND WYOMING COAL.

Received via Allentown, E. Penn'a Br.	538 18
" " Alburtis, " "	42 03
" " Oreland, G. & N. Br.	889 06
" " Connecting R. R.	.....
" " Willow Street R. R.	131 17
Total	1,572 04

BITUMINOUS.

From Harrisburg	9,399 15
" Connecting R. R., G. & N. Br.	.....
" Junction R. R.	202 13
Total	9,602 08

COAL FOR COMPANY'S USE.

Anthracite	7,191 01
Bituminous	220 15
Total	7,411 16

RECAPITULATION

	Total for Week.	Cor. week last year.	Increase & Decrease.
Passing over Main Line and Leb. Val. Branch	48,817 15	75,775 08	d 26,957 13
For Shipment by Canal	345 05	507 06	d 162 01
Shipped Westward via Northern Central R. R.	3,326 09	5,789 04	d 2,462 15
Shipped West or South from Pine Grove	2,010 09	1,598 13	i 411 16
Consumed on Laterals	2,507 08	3,453 04	d 945 16
Lehigh and Wyoming Coal	1,572 04	1,646 05	d 74 01
Total Anthracite paying fr'gt	58,579 10	88,760 00	d 30,180 10
Bituminous	9,602 08	10,921 16	d 1,319 08
Total of all kinds paying fr'gt	68,181 18	99,681 16	d 31,499 13
Coal for Company's use	7,411 16	3,327 18	i 4,083 14
Total Tonnage for Week	75,593 14	103,009 14	d 27,416 00
Previously this year	223,984 05	244,675 14	d 20,691 09
Total to date	299,577 19	347,685 08	d 48,107 09
SHIPPED BY CANAL.			
From Schuylkill Haven	625 11	755 04	d 129 13
" Port Clinton			
Total Tonnage per Week	625 11	755 04	d 129 13
Previously this year	12,334 00	35,470 13	d 23,136 13
Total to date	12,959 11	36,225 17	d 23,266 06

Lehigh Coal and Navigation Company.

Report of Coal transported over the Lehigh Canal and L. & S. Div. of Central Railroad of New Jersey for the week ending Dec. 23, 1871, and for the year 1871.

	WEEK.	YEAR.
Forwarded East of Mauch Chunk by Rail	33,183	1,300,713
Delivered at and above do.,	1,687	69,372
Forwarded East of do., by Canal	....	740,636
	34,870	2,110,791
Corresponding period last year—		
Forwarded East of Mauch Chunk by Rail	28,747	1,065,888
Delivered at and above do.,	1,755	48,308
Forwarded East of do., by Canal	....	789,111
	30,502	1,903,306
Increase on Railroad	4,307	255,805
Decrease " "		
Increase on Canal		
Decrease " "		48,475
Of the above there was transported on account of—		
Lehigh Coal Nav. Co	6,902	611,248
Wilkesbarre Coal & Iron Co	16,045	854,995
	22,947	1,466,243
Corresponding period last year—		
Lehigh Coal Nav. Co	12,735	314,497
Wilkesbarre Coal & Iron Co	11,445	632,708
	24,231	947,291
Increase	1,284	519,942
Decrease		

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Nov. 23, 1871, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	13,412 06	44, 95 03
" Hazleton	35,388 02	111,068 04
" Upper Lehigh	60 17	264 01
" Beaver Meadow	11,690 09	44,696 06
" Mahanoy	6,759 09	19,572 03
" Mauch Chunk	82 04	286 13
" Sullivan & Erie	1,022 01	3,336 01
Total Anthracite	68,415 08	223,918 01
Bituminous Coal from all sources	4,006 15	13,390 06
Total by rail and canal	72,422 03	237,308 07
Same time last year	67,114 00	240,974 16
Increase	5,308 03	3,666 09
Decrease		
Forwarded East from Mauch Chunk by rail	56,225 10	189,890 09
Same time last year	60,894 12	207,431 05
Increase		
Decrease	4,669 02	17,540 16

RECAPITULATION.

Forwarded East from Mauch Chunk by rail	56,225 10	189,890 09
Forwarded North from L. & B. Junction		
To N. C. R. R., at Mount Carmel	6,541 04	21,757 17
To L. & S. R R. at Packerton for rail	231 07	73 06
Delivered at M'h Chunk	53 16	299 08
Delivered on line of road above Mauch Chunk	528 06	241 15 2,271 16
Delivered above Mauch Chunk for use of L. V. R.R.	1,336 13	4,321 04
To L. & S. R. R., at Penn Har., for railroad	3,498 12	3,498 12
Do. for canal		864 07
At M.Chunk for canal		59 07
Total Anthracite	68,415 08	223 918 01
Bituminous Coal	4,006 15	13,390 06
Total all kinds	72,422 03	237,308 07

This report includes all Bituminous Coal carried over the Lehigh Valley and P. & N. Y. Railroads from December 1st 1870 to date.

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna and Western R. R. for week ending Dec. 23, 1871.

	Week. Tons. Cwt.	Year. Tons. Cwt.
Shipped North	9,822 12	545,177 13
Shipped South	44,269 00	1,267,918 07
Total	54,091 12	1,857,365 00
For the corresponding time last year :		
Shipped North	1,116 11	669,034 07
Shipped South	340 11	1,677,862 09
Total	1,457 02	2,345,896 16
Increase	52,634 10	
Decrease		488,531 16

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Dec. 23, 1871.

	WEEK.	SEASON.
North	42,348 02	1,627,039 10
South	4,998 05	331,588 07
Total 1871	47,346 07	1,958,628 06
Corresponding time in 1870 :		
North	451 07	1,931,489 18
South	4,433 02	423,555 13
Total	4,884 09	2,355,045 11
Increase North	41,896 15	
Decrease North		304,449 19
Increase South	565 03	
Decrease South		91,967 06
Total increase 1871	42,461 18	
Total increase 1871		396,417 05

Delaware and Hudson Canal Company.

The following is a statement of Coal Transpo ted by the Delaware and Hudson Canal Co. for the week ending Dec. 23, 1871.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal		991,825
By Railroad, East	8,217	342,309
" " West	1,362	113,551
" " South	4,998	331,588
Total Tons	14,577	1,779,273

For the same period last year.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal		1,292,675
By Railroad, East	7,689	447,731
" " West	3,502	86,746
" " South	4,433	423,555
Total Tons	15,624	2,250,707
Decrease	481,434	

Huntington and Broad Top R. R. Co.

For week ending Dec. 23, 1871	4,250 tons.
Same time last year	6,223 "
Increase	
Decrease	1,973 "
Total amount shipped to date	315,064 "
Same time last year	308,169 "
Increase	6,895 "
Decrease	

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Dec. 16. and during the year 1871, compared with the corresponding period of 1870.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B.&O.R.R. Co Tons Cwt.	Total. Tons. Cwt.
1871	.....	22,603 05	22,603 05
1870	.....	17,616 06	17,616 06
Increase		4,986 19	4,986 19
Decrease			

YEAR.

1871	653,470 02	1,213,604 00	1,867,024 02
1870	320,196 16	882,297 18	1,402,494.14
Increase	133,223 06	331,306 02	464,529 08
Decrease			

Cumberland Branch

WEEK.

	To C.& O. Canal Tons. Cwt.	To B.&O. R.R. C. Tons. Cwt	Total. Tons Cwt.
1871	.....	387 00	387 00
1870	.....	523 17	523 17
Increase		136 17	136 17
Decrease	.....		

YEAR.

1871	194,253 07	71,188 11	265,441 18
1870	84,253 05	112,512 02	196,750 07
Increase	110,015 02		68,691 11
Decrease		41,323 11	

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK, Dec. 30. R. A.	W. A.	AT PHILADELPHIA. Dec. 29. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$— —	— —	— —
Steamer	4 50	— —	— —	4 50
Broken	4 50	— —	— —	— —
Egg	— —	— —	5 00	4 75
Stove	5 00	— —	5 00	5 00
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 50	—	— —	— —
Broken	5 50	— —	— —	— —
Egg	5 50	— —	— —	— —
Stove	6 00	— —	— —	— —
Chestnut	5 00	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.				
Diamond Vein	R. A.	6 00@6 25	— —	— —
New England	"	—	— —	— —
Locust Mountain	W. A.	6 50	— —	— —
Honey Brook, Le'h	W.A.	5 00@6 00	— —	— —
Spring Mountain	" "	5 00@6 00	— —	— —
Sugar Creek	" "	5 00@6 00	— —	— —
Sugar Loaf	" "	5 00@6 00	— —	— —
Old Comp'y's	" "	5 00@6 00	— —	— —
Cross Creek	" "	5 00@6 00	— —	— —
Room Run	"	5 00@6 00	— —	— —
Girardville	" "	—	— —	— —
McMichael	" "	— —	— —	— —
Shamokin	" "	5 25	— —	— —
Lykens Valley	" "	5 75	— —	— —
Broad Top	" "	5 25	— —	— —
Hill & Harris	" "	— —	— —	— —
Henry Clay	" "	— —	— —	— —
Powelton	"	5 25	— —	— —

*Dealers in these coals may be found in our advertising columns.

Company Coals.

Jan. 1872.

	L.	Str.	Gra.	Eg.	Sto	Chest
*Scranton at E. Port	— —	— —	— —	— —	— —	— —
*Pittston at Weehawken	4 60	4 60	4 80	4 90	5 20	4 60
*Lackawana at Weehawken	4 60	4 60	4 80	4 90	5 20	4 60
Wilk'b're at Hoboken	4 60	4 60	4 80	4 60	5 50	5 40
Old Co. Lehigh at P.John'n	5 00	—	5 00	5 00	5 50	4 50
Lehigh at Eliz. Port	5 00	—	5 00	5 00	5 50	4 50

For freights to different points see "Freights."
* To contractors.

Line Prices for Coal Dec, 1871,

	Lump	Broken	Egg	Stove	Chest't
At Mauch Chunk	4.00	4.00	4 00	4.25	3.00
" Wilkesbarre	3 75	3.75	3.75	4.00	3.00

Prices at Baltimore—Dec., 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 60@5 85
Pittston and Plymouth, do	— —@5 60
Shamokin Red or White Ash, do	— —@5 60
Lykens Valley Red Ash, do	— —@6 30
Zerba Valley	— —@— —
Trevorton	— —@— —
By retail, all kinds per ton of 2240 lbs	7 00@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	— —@4 50
Fairmount and Clarksburg gas, f. o. b. at L. Point	6 00@6 50
BITUMINOUS COALS.	
Kittaning Coal Co.'s Phœnix Vein f.o.b. at Phila	$ —
Lemon " " "	—
Cumberland Vein Coal	—
Consolidation Coal Co.'s on board N. Y.	7 50
Maryland Coal Co. " "	7 50

Prices at Georget'n, D.C., & Alexandria, Va.

Jan, 1872.

George's Creek and Cumberland f. o. b. for shipping $4 50

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$5 25@5 50
Lykens Valley	6 25@6 50
Shamokin Red or White Ash	5 50@5 75
Trevorton and Zerba Valley	— —@— —

Prices of Gas Coals.

Jan, 1872.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

Duty, $1 25, gold

	Coarse	Slack.
Block House	$1 75	@-1 75
Gowrie	1 75	@-1 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal
Pictou	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 60	@- 80
Little Glace Bay	1 60	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal

AMERICAN.

	Currency.
Westmoreland	$7 00 @- —
Fairmount Gas Coal Co. of N. Y.	7 00 @- —
Despard Coal Co.	7 00 @- —
Penn	7 00 @- —
Newburg Orrel Gas	— — @- —
West Fairmount Gas Coal	7 00 @- —
AT PHILADELPHIA.	
Powelton	$6 75
TO NEW YORK.	
Provincial.	
Sidney	$3 25
Lingan	3 25
Cow Bay	37½
Port Caledonia	3 37½
Little Glace Bay	3 25

Prices of Foreign Coals.

Jan, 1872.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, N. Y.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	12 00@13 00
" House "	18 00@20 00
" Orrel	14 00@16 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$16 00@17 50
"Cannel, "	18 00@20 00
Per ton 2,000 lbs. delivered.	

Freights.—Jan. 1872.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore.	Anthracite. From Philad'a.	Anthracite. From Elizabethport, Port Johnston, and Hoboken.	Anthracite. From Newburg.	Anthracite. From Rondout.
Amesbury						
Bangor						
Bath						
Boston		3 90		3 25		
Bridgeport		2 30		1 10		
Bristol						
Cambridgeport						
Derby						
Dighton						
East Cambridge						
Fall River						
Hackensack						
Hartford						
Jersey City				55		
Middletown						
Mystic						
New Bedford		3 50				
Newburyport				1 10		
New Haven				1 25		
New London			3 25	3 50	1 40	
Newport				55		
New York		2 30		1 10		
Norwalk				1 50		
Norwich				1 00		
Pawtucket						
Portland						
Portsmouth, N.H						
Providence		3 00				
Rockport						
Saco						
Sag Harbor				1 20		
Salem						
Stamford				1 10		
Stonington				1 25		
Taunton						
Warren						
Washington						
TO RIVER PORTS.						
Albany						
Catskill						
Cocksackie						
Cooyman's						
Cold Spring						
Fishkill						
Haverstraw						
Hudson						
New York						
Nyack						
Poughkeepsie						
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy						
West Point						
Yonkers						

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven for consumption	$2 18
For reshipment	2 00
MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 76
C. R. R., N. J., Phillipsburgh to Elizabethport	1 11
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 22
MAUCH CHUNK TO PORT JOHNSON.	
L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 76
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 11
Shipping expenses	25
Wharfage	10
Total	$2 22
TO HOBOKEN.	
L. V. R. R., Mauch Chunk to Phillipsburgh	$ 76
Morris & Essex R. R. Phillipsburgh to Hoboken	1 11
Shipping expenses	25
Wharfage	16
Total	$2 22
TO SOUTH AMBOY.	
L. V. R. R.	76
R. & D. R. R. / Cam. & Am. R. R.	96
Shipping Expenses	35
Total	$2 07

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	76
C. RR. of N. J. Phillipsburgh to Elizabethport... ..	1 11
Shipping expenses	25
Wharfage	10
Total	$ 2 22

MARKET REVIEW.

FOR THE WEEK ENDING DECEMBER 30th 1871.

IRON—There has been very little inquiry for Scotch Pig, and prices are somewhat irregular, but we do not change our quotations—the only sale we have to note is 150 tons Glengarnock on private terms. American is in limited request, but prices remain steady—we quote No. 1 $36, and No. 2 $34@35. The market for both new and old Rails remains quiet, but steady, at $57@$59 gold for new English, and $70@$71 currency for American, at the works in Pennsylvania. Bar continues steady and firm at previous quotations, both in the home and foreign markets. Common Sheets continue scarce and firm at our quotations, and Russia Sheet is nominally unchanged —we quote the latter 15¾@16 cents gold.

LEAD—There is a little more movement in Foreign Pig at prices in sellers favor; the transactions are 50 tons Spanish at 6 cents; and 25 do. second quality, 5¾ gold. Manufactured is steady at old figures.

COPPER—New Sheathing is firm at 34 cents, and Bolts and Braziers' 36. Bronze and Yellow Metal Sheathing 24, and Yellow Metal Bolts 26, net cash. Ingot has been quiet, but prices are sustained; sales have been made of 50,000 lb. Lake at 27¼ cents, cash, and about 27½ for January; and 50,000 lb. for delivery end of this month, 27⅞.

The Portage Lake *Mining Gazette* says:—All circumstances considered, we regard the season just closed as being one of unequaled prosperity in Houghton county. This is especially so as far as the production of Copper is concerned. The yield of mineral from the Portage Lake district for the year ending December 1, 1871, was about 12,745 tons, being but a few tons in excess of the amount produced in 1870. The sources which contributed this large lot of Copper are as follows:—

	Tons.	Lbs.
Calumet & Hecla	9,660	1,525
Quincy	1,505	1,074
Schoolcraft, Franklin-Pewabic Houghton, Hancock, and various tributers.	1,578	1,297
Total	12,745	1,906
Total in 1870.	12,731	1,467
Increase in 1871	41	439

SPELTER—Foreign remains very firm; 20 tons Silesian sold at 7⅛ cents, and 25 do. S. S., 7 gold, domestic 10 c. currency.

STEEL—There is no change in prices for lots from store —market firm.

TIN—There has been no business in Pig, and prices are wholly nominal. Straits is held at 38½ cents, English 38, and Banca 43, all gold. About a week or so ago, telegrams were received from London noting a decline there, in consequence of a "sell out" by an operator, Straits being quoted 150s., and English 152s.; since then we believe, no further despatches have come to hand. Plates remain firm, in sympathy with the high prices ruling abroad, current quality are selling at 32s. in Wales, and 33s. in Liverpool; 1200 bxs. Assorted Charcoal have been taken at $9,37½@10 50 for I. C., gold.

ZINC—Sheet is quiet but firm at old rates, viz. 10½ c. gold. Manganese black oxide 3½ currency; Manganese Pyrolusite gray 5½ currency.

METALS.

NEW YORK, Dec. 30, 1871.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1¼ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ℔ lb; Pig, $7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2¾; Scrap Cast, $6; Wrought, $8 per ton.

	Store Prices
Pig, Scotch No. 1, ℔ ton	33 50@38 00
Pig, American, No. 1.	36 00@— —
Pig, American, No. 2.	34 00@35 00
Pig, American, Forge.	33 00@34 00
Bar Refined, English and American.	— —@86 00
Bar Swedes, assorted sizes (gold)	86 00@103 00

	Store Prices, Cash.
Bar, Swedes, ...	107 50@120 00
Bar, Refined, ord'y sizes.	90 00@ — —
Bar, Refined, 1¼ to 6 by ¼ @ 5-16 inch	— —@ 95 00
Bar, Refined, 1 & 1¼ by ¼ & 5-16.	— —@ 97 50
Bar, Refined, 2½ to 3 Round & Square	— —@ 97 50
Scroll.	107 50@137 50
Ovals and half-round.	107 50@125 00
Band	— —@102 50
Horse Shoe.	105 00@115 00
Rods, ⅝ to 3-16 inch	95 00@130 00
Hoop.	112 50@160 00
Nail rod.	6¼@ — —
Sheet, Russia, as to assortment (gold)	15¾@ 16
Sheet, Single, D, and T. Common	—5¾@— 6
Sheet, D. and T. Charcoal.	—6 @— 6¼
Sheet, Galv'd, Nos. 14 to 26. ..... 27½ to 30 ct. dis.	12@14c lb.
" " Nos. 27, 28, and 29. ..... 27½ to 30 ct. dis.	15@18c lb.
Rails, English (gold), ℔ ton.	57 00 @59 00
Rails, American, at Works in Pa.	70 00 @71 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb.	— @— 34
Copper Bolts.	— @— 36
Copper Braziers, 16oz. and over.	— @— 36
Copper Nails.	— @— 40
Copper, Old Sheathing, &c. mixed lots.	25½@— 26
Copper, Old, for chemical purposes, 14@16 oz...	— @— —
Copper, American Ingot.	27½@— 27¼
Yellow Metal, New Sheathing & Bronze.	— @— 24
Yellow Metal Bolts.	26 @— —
Yellow Metal Nails	— @— 24

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb; Pipe and Sheet, 2¼ cents ℔ lb.

Galena. ℔ 100 lbs.	$— — @— —
Spanish (gold)	5 85 @5 95
German, do.	5 85 @5 95
English do.	5 90 @6 25
Bar ..... (net)	9 25 @ — —
Pipe ..... (net)	— — @10 25
Sheet.	— — @10 25

Colwell, Shaw & Willard Tin-Lined Lead Pipe 15 cts. ℔ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb. and 10 ℔ cent ad val. (Store prices.

English Cast (2d and 1st quality) ℔ lb.	— 15 @— 18
English Spring (2d and 1st quality), ...	— 7 @— 10
English Blister (2d and 1st quality).	— 10 @— 17
English Machinery.	— 11 @— 13
English German (2d and 1st quality).	— 10½@— 12
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— 15 @— 16
American, Spring, do.	— 9 @— 11
American Machinery, do.	— 9 @— 10
American German, do.	— 9 @— 11

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca.	— @43
Straits.	38½@—
English	38 @—

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ℔ box	$9 37½@9 62½	$10 25 @11 00
I. C. Coke.	8 25 @9 00	9 25 @10 25
Coke Terne.	7 00 @8 00	8 00 @ 9 25
Charcoal Terne.	8 25 @8 50	9 50 @10 25

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, Foreign ..... (gold) ..... p. 100 lb.	6 87½@ 7 25
Plates, Domestic. ..... p. lb.	— 7 @— —

ZINC.—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per lb

Sheet. ..... per lb.	— 10½@— 11¼

San Francisco Stock Market.

BY TELEGRAPH.

The following from the San Francisco Mining Stock Board is dated the 23d inst: With the single exception of Belcher the market has materially declined. Kentuck which we intimated in our last, was above its level forms the most prominent feature in the decline list, being $22 lower than reported on the 16th inst. Belcher on the 19th sold for $445 per share, our report of to-day places it on the list at $432, still an advance of $39 compared with our last quotations. Eureka G. V. has slightly appreciated. A recent number of the "*Alta*" states that the productions of the seven leading mines for the month of November, were about eighty thousand dollars in excess as compared with the previous month.

Savage.	46
Yellow Jacket.	61
Kentuck.	143
Chollar Potosi.	..
Gould & Curry.	110
Belcher.	432
Crown Point.	..
Raymond & Ely.	..
Imperial.	..
Amador	..
Eureka G. V.	24½
Meadow Valley.	..

Mining Stocks.

Excepting a slight decline in Quartz Hill and Gregory the mining stock list is unchanged. No sales; the quotations of the Board are as follrws:

GOLD STOCKS.

	BID.	ASKED
American Flag	—	20
Bates & Baxter.	25	—
Benton.	—	5
Black Hawk.	—	50
Central Gold.	—	5
Cons Gregory...	—	20
Grass Valley.	—	6
Gunnell.	8	—
Holman, ...	—	—
La Crosse.	12	16
Liberty.	—	3
Mariposa prf.	—	—
Montana.	—	—
Rocky Mount...	—	5
Quartz Hill.	—	8
Smith & Parmlee.	—	—
N. Y. & Eldorado	15	—

The petroleum list is strongest, with the single exception of United Petroleum Farms, which as usual follows a contrary course; Central and Home form the notable features in the advance list. On the 21st inst., two sales of Home comprising 600 shares were effected at $1.45—on the 23d 100 Central changed hands at 70—on the 26th 500 shares of the same item were disposed of at 68c., which completes the sales for the week. The following are the quotations as furnished by this Board.

PETROLEUM STOCKS.

	BID.	ASKED.
Bennehoff Run	15	—
Bergen Coal and Oil	—	—
Bliven Oil.	—	—
Blood Farm	—	—
Brevoort	25	35
Buchanan Farm	40	—
Central	65	—
Clinton.	—	—
Home	1 50	—
National	10	—
New York & Allegheny	1 00	—
Northern Light	35	—
Phillips Pet	—	15
Pithole Creek	—	1 00
Rathbone Oil	20	—
Rynd Farm	33	—
Second National	—	40
Sherman & B	—	—
Tarr Farm	—	—
United Petroleum Farms	30	—
United States	—	70

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WYOMING & LACKAWANNA

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This Map embraces the territory extending from the Western extremity of the coal fields to Blakely, about five miles east of Scranton, and the mountains which on each side of the valley limit the area of Coal Lands. It shows plainly and truthfully

All Collieries,

Lines of Property,

and Names of Land Owners.

The entire Map is from

ORIGINAL SURVEYS,

and occupied in its compilation a period of over

FOUR YEARS.

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1000 FEET TO THE INCH,

and covers a paper surface

15 Feet Long by 42 Inches Wide.

A portion of the expense of preparing this Map was defrayed by the

Lehigh Valley Railroad Company,
Lehigh Coal and Navigation Company,
Delaware and Hudson Canal Company,
Delaware, Lackawanna and Western Railroad Company.

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Measurements of Progress.

Motion is apprehended only by successive observations and comparisons. We perceive at this instant that a body is in a certain position, and at the next, that it occupies another; and we say that it has moved. Nay, more; if our observations are taken at small intervals, we say we see it move, though in fact we only see it at rest. The whole universe around us and in us is constantly in motion; yet we perceive only rest. The idea of motion is a deduction, not a perception; and this paradox or contradiction between phenomena and realities contains within itself the whole mystery of the physical world, since all phenomena are strictly instantaneous, and all realities strictly continuous. Life and growth being essentially motion, are no exceptions to this law; and it may without an undue exercise of imagination, be extended into the world of spirit, at least by way of analogy and illustration. As we can only determine the successive changes in an animal or a tree by successive observations, so we can only decide whether a mind is growing by successive observations upon its condition. And what is true of individual men, is equally true of mankind. The question, Do we advance on the whole, or in any one respect? is merely the question, Have we advanced? It is the province of history to reply; and no man has ever been foolish enough to ask at any other oracle. The despiser of the remote past still takes his bearings from yesterday, or the last year, or the generations of his fathers, running perhaps the risk of greater errors in measuring on so small a scale, and thus employs the very principle which he affects to contemn. On the other hand, the antiquarian and worshipper of the past is apt to select for the basis of his reckoning some landmark made faint and wavering or vaguely vast by distance, and overlook the safer guides that stand in the foreground. But no man, of whatever philosophy or temperament, attempts to decide for himself or his race the important questions: Do we move? How fast? and Whither? without an appeal to History.

Now if History were a series of photographs, such as RUTHERFORD makes to determine the positions and movements of the stars, we might expect to obtain from inquiries of this kind something like satisfactory results. But in fact, it is as if RUTHERFORD's glasses were distorted, and his equatorial movement jerky, and half the stars invisible, and two-thirds of the photographs lost, and the remainder altered by the astronomer himself, to suit his notion of what should be the most appropriate picture of the sky. The lens of History seems to have no focus. It is hard to say whether objects close at hand, or those most remote, are more sadly blurred and twisted. Yet an imperfect instrument is better than none; and repeated experiments will enable us to eliminate from our observations many, if not all, errors. Before I drop this convenient figure, let me allude to one important error, which has been more clearly pointed out in modern times, and which sadly interferes with the success of our attempts to estimate the general progress of our race. Motion is not observable when the moving body is approaching the observer in a direct line. We are only able to perceive it accurately, when it takes place on a line opposite to us, and outside of us, or, let us say, along the circumference of a circle, of which we are at the center. In like manner, the historians of the past have chiefly recorded the progress of conquests, the rise and fall of dynasties, and the fates of kings—matters that move in some sense, however influentially, outside the line of the advance of the race. But now we laboriously decipher the ancient palimpsests and hieroglyphs, or the pages of classic authors, and endeavor to collect fragment by fragment, and reconstruct in symmetry and truth, the pictures which they might have given us complete. We are thankful to some RAMESES for the ponderous self-glorifications that perpetuate his name; not because we care particularly who ordered this or that temple to be built, but because we can glean from the hieroglyph how the great work was done, and infer a thousand things about the times which neither the prince nor the architect nor the courtier thought worthy of mention.

In the Poet's corner of Westminster Abbey there is a tablet upon which with great particularity the petty titles and performance of one BENSON are set forth, a Knight of some order or other, and, if I remember rightly, alderman of some town or other; and this splendid personage, we are informed in a comparatively inconspicuous line of the inscription, set up the tablet in honor of "the Author of Paradise Lost." BENSON has acquired immortality, but it is the immortality of Thersites, not of Achilles. Millions have stood, with no feeling but contempt for the elaborate blazonry of BENSON, before the stone which testifies the fame, though it does not bear the name of MILTON. And it is often with similarly blended feelings of indifference and reverence that we approach the book or the monument by which some man, lifted up by the accident of power above his fellows, has sought to perpetuate an insignificant name. We do not care much for King or Kaiser, but in some less conspicuous line we find and reverently study the memorial of the people and the age, upon the vast tides of whose multitudinous life the potentate was but a bubble.

In considering, then, current questions of progress, it is well to bear in mind that there is a modern method of determining progress, by comparing different ages in respects less conventional and artificial than those of diplomatic intrigue or military power, and by giving to these things a weight proportionate to their actual influence, and not their outward show. What would we not gain, had this method been always followed? We could afford to give nine-tenths of what we have of Roman literature for a single census of the Roman empire, crammed with dry statistics. They would speak to us as eloquently as Cicero and as wisely as Seneca. And of what we have from that age, the incidental glimpses of life and society afforded in the lighter writers are worth more than the labored works of the philosophers. HORACE's Brundisian Journey, describing a brief trip on a canal-boat, is history of the best kind, for all the purposes of history. R. W. R.

Polytechnic Association of the American Institute.

Meeting held December 22, 1871.

After the lecture of Mr. COLTON, the following remarks were made:

Mr. ABRAM S. HEWITT—The region in Alabama to which our attention has been called to-night is unquestionably the most interesting region in the United States, with reference to the interests of iron manufacture in this country. It is in fact the only place upon the American continent where it is possible to make iron in competition with the cheap iron of England, measured, not by the wages paid, but by the number of days' labor which enter into its production. The cheapest place until now, on the globe, for manufacturing iron, is the Cleveland region in Yorkshire, England. The iron, produced from a fossiliferous ore, containing phosphorus, making it cold-short, costs there about 32 English shillings on the averrge per ton, which represents about ten (10) days' labor. The distance of the coal and the ore from the furnaces averages there about 20 miles.

Now in Alabama, the coal and the ore are in many places within half a mile of each other. The sandstone formation thins out towards the South, and in Tennessee and Alabama appears to be replaced by this bed of fossiliferous iron ore, which commences in New York, with a thickness rarely exceeding two feet, but steadily thickens towards the South, averaging four feet in Pennsylvania, seven or eight feet in Tennessee, while in Alabama, probably because the formation was crushed back upon itself in some way, there are places where the iron has been measured 150 feet in thickness.

The manufacture of iron is carried on as yet in rather a crude way in Alabama; but the cost of the iron is only about ten days' labor to the ton, or not far from the labor cost in Cleveland. Throwing aside then all questions of tariff for protection, here is a possibility upon the American continent of producing iron at as low a cost in labor as in the most favored region of the world, and allowing for the expense of transportation to compete with them, paying a higher average rate of wages than is paid in Great Britain.

The consumption of iron is increasing at a rate so wonderfully rapid that in ten years it will be impossible for Great Britain to supply the demand. There is no other country in the world which can make iron as cheaply as Great Britain. In fifty years then the United States must be the source from which the iron of the world will be derived. Instead of importing a million of tons per annum, as we now do, in fifty or a hundred years we shall export five or ten millions per annum. This region, so exhaustless in its supplies, so admirably furnished with coal, so conveniently communicating with the Gulf, will be of infinitely more consequence to us for its iron than it has ever been for its cotton. There is the foundation for an industry and a prosperity which no curse of slavery, no rebellion, no interference with commercial laws can ever overturn.

One word about the applicability of the ores. As I have said, they all contain phosphorus. The quantity is too great to permit its being made into steel by any known process. It is useless to talk about its producing steel. It is hard, because it contains phosphorus; and what is bad iron can hardly be good steel. It is fitted admirably for the face of rails, and for bar iron generally. By mixture we can make these cold-short irons neutral. I think this will be a region of coke-made iron on a scale grander than has ever been witnessed on the habitable globe. The present production in the Cleveland region, where in 1853 there was not a furnace, is now two millions of tons; and very soon it will be four millions. The production here will far exceed that.

The difficulty in the South at present is the want of a market, from the incomplete state of the lines of railway which are now extending in all directions, and which will soon connect this region not only with the North, but with the Gulf.

These remarks apply to the region of East Tennessee with equal force as to Alabama. In conclusion, let me testify to the spirit of perfect frankness with which Mr. Colton has presented this interesting subject to the Association, to whose thanks he is justly entitled.

The Resources of Arizona.

An interesting pamphlet under this title has been published by authority of the Legislature of Arizona, for the purpose of disseminating information concerning the Territory. It was proposed by a Board of three Commissioners, of whom Governor A. P. K. SAFFORD was one, Messrs. CHARLES H. BRINLEY and JOHN G. CAMPBELL being the two others. Though brief and general in its statements, it gives a good outline of the condition and prospects of Arizona. Mining matters are but scantily treated, it having been thought, perhaps, that the elaborate report of the United States Commissioner of Mining Statistics under that head, makes it unnecessary to go over the ground immediately again. The statement of the Indian question seems fair and discriminating, and contains many passages of interest concerning the customs and traditions of different tribes.

Arizona is fortunate in having a body of officials who take a hearty interest in the development and welfare of the Territory. Governor SAFFORD, Delegate MCCORMICK, Surveyor General WASSON and others, are men who do not shrink from personal labor and inconvenience, if they can in any way serve the interests of Arizona. We trust that their devoted exertions will be rewarded by the speedy advent of peace and prosperity to the Territory.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
WILLARD P. WARD, M. E.
Editors.

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Affairs in Colorado.

Our advices from Colorado indicate a healthy progress in the actual and legitimate industry of mining. The following notes of operations in Clear Creek county will be found interesting:

The Stewart Reduction Works treated from July, 1870, to July, 1871, 1,390 tons of ore, of which the assay value was $201,700, and the yield $180,785. From July 1 to November 1, 1871, the quantity treated was 500 tons and the yield $58,811.

The works of PALMER & NICHOLS treated from March 26 to July 1, 1871, 228 tons of ore, assaying 38,493 ounces of silver, and from July 1 to November 1, 1871, 203½ tons, assaying 36,136 ounces of silver, making a total of 431½ tons, with 74,629 ounces. The yield has been about 86 per cent. of the assay, and the concern has shipped, up to November 1, $84,000, coin value. Adding 80 or 90 tons treated previously to March 26 by HUEPEDEN & Co. (mainly second and third class ore from the Brown and Terrible, and estimated at $77 yield per ton) we have over $90,000 as the product of these works during ten months of 1871. The average yield per ton of ores treated by STEWART has been: For the year ending July 1, 1871, $130; for the four months ending November 1, 1871, $117; for the whole sixteen months, $126. The average yield of ores treated by PALMER & NICHOLS has been: For three months ending July 1, 1871, $189; for the four months ending November 1, 1871, $198; for the whole seven months, $194. This high yield is due to the fact that much rich surface ore has been brought in from small mining operations to these works. STEWART'S supply is mostly from the lower grades of Terrible ore, upon which he has now ten stamps (half his capacity) for the greater part of the time.

Among the new mines that are worthy of attention and promise to become largely productive, are the Pelican and Elkhorn, and in East Argentine district the Belmont and International. In the latter district Dibbin's Reduction Works (one Bruckner cylinder) have been shipping for four or five months from $1,200 to $1,500 per week.

It is still difficult to say what has been the precise degree of success achieved by the AIREY furnace. It is said to be running regularly: but trustworthy accounts of its efficiency and economy have not yet come under our notice.

The general prospect for the silver mines of Colorado is encouraging. When we come to sum up the shipments of ores and the yield of those treated in the Territory for the year 1871, it will be seen that the production considerably exceeds that of former years, though, of course, the extravagant expectations of the sanguine ones have not been realized.

The Danks Puddling Furnace.

Messrs. SNELUS, JONES and LESLIE, the three commissioners sent to this country by the English Iron and Steel Institute to examine the merits of DANKS'S mechanical puddliug furnace, have reported by cable as follows:

"DANKS' *furnace successful. Construct furnaces for ten hundred weight; squeeze or hammer single ball. Economy and quality satisfactory. Commission well.*"

The *Iron and Coal Trade Review* understands this to be a thorough endorsement of the furnace, and a suggestion on the part of the Commissioners that the furnaces to be built in England shall be large enough to manipulate over 1100 lbs. of iron, instead of 600 to 800 lbs., which, it says, is what DANKS himself had talked of; and it points out that the appliances for rolling and hammering the large puddled blooms will have to be on a much larger scale than at present; so that those who adopt the revolving puddling furnaces will have to reconstruct their forges entirely.

Probably the effect of the telegram was merely to arrest the operations of such ironmasters as were on the point of repairing, constructing or enlarging works upon the old plan. It is not likely that anybody commenced at once to "construct furnaces for ten hundred weight" upon these brief cable advices. Nor is it certain that this great triumph wins the whole battle for Mr. DANKS in England. He has still to struggle wilh the manufacturers, whose interests may lead them to accept the inovation but deny the legal claims of the inventor, and with the workingmen, whose bitter opposition to the introduction of machinery which temporarily "takes the bread out of their mouths," has been manifested in countless instances. But opposition from the former quarter will, we trust, be averted or overcome, by the triple force of the alliance with the Iron and Steel Institute, the strength of the Danks patent itself, and the moderation of the royalty (2 s. per ton) which the inventor has fixed. Nor is the hostility of the workingmen to be so much feared as formerly. The growth of Trades Unions has effected a great change in this respect. Labor cannot any longer be put down by force; but it is far more amenable to reason. The late strike at Newcastle, for instance, has shown most clearly that argument and mutual concession are taking the place of unreasoning violence on both sides. The workingmen are organized, and their leaders are men of ability. We do not believe that they will blindly oppose the introduction of improvements, though they may require (as they have a moral right to do) that changes shall be made in such a way as to avoid, as much as possible, the infliction of suffering upon large classes of laborers.

The Burning of Coal Dust.

There is scarcely a question which is attracting more attention from practical and scientific men than that which relates to the utilization of the fine coal from our mines. Immense quantities of fine coal are produced annually in the ordinary operations of mining and preparing coal for market. Up to the present time no means have been discovered for preventing this pulverization, and no method has been so generally introduced, and proven to be so economical and reliable as to give to this refuse product a market value.

It appears probable that the relative amount of dust to good coal may be diminished by the exertions now being made to achieve this desirable end, still no matter how we mine, or how we prepare coal for the market, there will always be a considerable quantity of dust produced, so that its utilization is a more weighty matter than the discovery of means to save a portion from being ground up.

Some time since we published an account of WHELPLEY and STORER'S method, and since that time we have heard of several others, but none of them has been proved fully equal to the task imposed upon it, and we therefore regard this as a very prominent field for experiment. We do not mean to assert that WHELPLEY and STORER'S process, or LOISEAU'S process, a description of which will be found in another column, will not eventually be shown to be entirely satisfactory, but this can be done only by a continued use of the process in practical working, and to this test, so far as we have been informed, they have not yet been subjected.

As the question is purely an economical one, the cheapest and simplest method is of course the one to be sought for. If nearly or quite as much money is spent in preparing a ton of coal-dust for combustion as a ton of good lump coal would cost, no advantage could be derived from the use of a process involving the expense, and we must say that the processes by which the dust can be burned without being previously fashioned into bricks appear to us to have a decided advantage in point of economy.

In the report of the Committee of the Franklin Institute the economical side of the question is referred to only in the last paragraph, in which they recommend Mr. LOISEAU'S process to those interested in the production of a cheap fuel, adapted to a great variety of uses. The cost of the fuel is fully as important as its steam generating capacity; and on this point we would be pleased to have further information.

New Publications.

From the annual report of FRANK H. BRADLEY, Professor of the Natural Sciences at the East Tennessee University, on the coal and iron lands of the Wilcox Mining Company of Tennessee, we notice that an excellent quality of bituminous coal is found there. The main seam averages rather more than four feet in thickness. The coal contains but a small percentage of sulphur, and softens but very slightly in the fire, so that it would be well adapted for the blast furnace without previous coking. The company have several other workable seams of good coal on their property, which seems to be well situated for exploitation. The report is accompanied by a handsome geological map which must have required considerable faithful labor in its construction, a portion of the work having been done by CHARLES WARING, C. E.

Professor BRADLEY'S report contains an approximate section of the geological formations of the vicinity, giving the thickness of the various strata and their order of sequence. Several of the coal seams are identified with those found in the Etna mines, below Chattanooga, and the scope of the report is sufficiently broad to render it serviceable in the examination of lands in that region. We are not

sufficiently acquainted with the facts to speak concerning the correctness of the geological classification; it would, of course, require careful observation and study to enable one to pass judgment upon them; but the report appears to be free from the scientific, grammatical and orthographic inaccuracies which abound in several reports on the Southern coal and iron lands which have been brought to our notice.

T. GUILFORD SMITH, C. E., has made a report to the President of the Alabama and Chattanooga Railroad Company, concerning the resources of the country through which their road passes. These consist, as is well known, chiefly of the immense deposits of coal, iron, and limestone, which promise to afford a large traffic for the railroad company, and the building up of a large and thrifty iron industry.

The Brown-Hematite Ore Deposits of South Mountain, Between Carlisle, Wainesbro', and the South-Eastern Edge of Cumberland Valley.*

"The Pond banks and Caledonia banks, and the English diggings are several openings of greater or less size in the upturned belt of slates surrounding the Little Mountain, which rises as an isolated ridge, one or two miles long, from the floor of the valley. The English diggings are behind it, the Caledonia bank before it, and the Pond banks at the south end, in the plain. The ore mass in the Caledonia bank dips towards the mountain, but must certainly rise again upon its flank. The English ore evidently dips away from the mountain. The shape of this vast excavation is that of a crescent, with nearly vertical sides, and an irregular bottom. Its total length is about 300 yards, and its depth to the general floor, is from 60 to 80 feet. The ore appears within 10 to 20 feet of the surface, at some points, and at others, not for 30 or 40 feet down. Mountains of stripping stand beside it to the west; above where the body of the ore turns over a small anticlinal, and buries itself westward beneath undecomposed limestone. The depth of the ore is still unknown. Shafts from 60 to 110 feet have been sunk in it at the sides, and in the bottom of the present excavation. The top of the ore stratum, at the extreme north end of the quarry, is exactly on a level with the edge of the upper Pond bank, which is only 5 or 10 feet above the top of its own ore, into which the mining has descended 30 to 40 feet. The lower Pond bank is on a slightly higher level. The fact is, therefore, that all these three excavations, separated by only one or two hundred yards of interval from each other, and extending in a line about one thousand yards, are sunk in one deposit of ore, or, to speak more correctly, in the broad overlapping margin of the ore-bearing slate deposit, which sweeps round the south end of the Little Mountain in a nearly horizontal, and partly basin-shaped posture,

In the bottom of these excavations, the ore is reported as uniformly well compacted. In the upper end (north end) of the Caledonia bank, at a depth of say 60 feet from the surface, I saw the top of a body of ore which was as solid as a mass of cellular, brown hematite ore could be. In other parts the ore is distributed through clay. The whole is being worked with pick and shovel."

Of the quantity of ore in this bank, he says: "Taking the length and width of the three banks for a basis of calculation, and giving only fifty feet as the average depth of the ore, and deducting fifty per cent for clay (which is very large) we have 850,000 cubic yards of ore in the ground, from which the extracted ore has been deducted," and "starting with this amount of ore in sight, and applying the calculation to that descending on the west, ascending again on the east, outspreading to the south, and filling the little valley behind the Little Mountain, we get many millions of tons in addition, and under precisely the same conditions."

Traversing the footlands and flats five miles southward between the mountain and Quincy from Mont Alto furnace to Weynesboro, we have evidences of a continuation of these beds, as rich and in all probability as abundant as those spoken of by Mr. Lesley on the north. Unshapen masses of ore weighing from ounces to hundred-weights are to be seen on the surface, the former in many places covering it to the detriment of cultivation. The fences are built of it, and every plough turns up a fresh supply, and, to the farmer, renewed cause of annoyance. There are places on the footlands to be seen where ore one day has been gotten, but as a rule, owners of properties have devoted their energies to the cultivation of the surface, to the almost total disregard of the mute but importuning evidences of the greater mineral wealth beneath.

Taking as a basis of calculation the ore gotten and exhibited at Pine Grove diggings, and corroborated by what we have just read of Prof. Leslie's report on Mont Alto ground, and we have 35 feet depth of ore face in work and 107 feet bored into and not bottomed, together 142 feet, say 50 per cent. of this is clay in which the ore is imbedded but of which large per centage we have met with no example, and we have 71 feet of ore, but that we may not exaggerate, reduce this to 60 feet.

As will be readily understood, the weight of the ore varies according to its quality. The specific gravity of a hand specimen we brought away is 3.821 giving 238 lbs. per cube foot, the ore gotten at the top of the excavation would not be so much. When gotten and in the heap it is found to weigh from 112 to 120 lbs. per cube foot. We shall not err then, and after the deductions just made, in calling it 120 lbs. per foot when in the bed.

Now we have said the ore overlays the valley and slope of the Mountain here, from a quarter to three quarters of a mile wide, the average of which would be half a mile. Instead of which and for no other reason than security against overestimation, call it 1,000 feet, and we have 15,840,000 long tons per mile, or between Pine Grove opening and Grave Ridge, 55,440,000 tons.

But along the route traversed, we have 13 miles of ore ground exclusive of that on the Hosack and Birch runs, and the magnetic ores of Mont Alto and Caledonia, of neither of which are we in the possession of the facts necessary for computing quantities. Leaving these out of the question then, we have without them 209,920,000 tons.

That the value of these figures may be the more readily realized, there are three charcoal furnaces on this route, say, each produce 60 tons of iron per week, which with good management they probably would, and it will take 100 such furnaces 330 years to exhaust the ore. Or by the light of things more modern, assume that 250,000 tons of anthracite iron are being made per year, there would be wanted for all purposes 450,000 tons of coal creating 700,000 tons of freightage. In addition let there be 500,000 tons of ore per year gotten and exported, and there is produced 4,000 tons per day of mineral freightage over the Cumberland Valley and South Mountain Railroads for the working days of 205 years.

In making out these quantities, calling the length of ore ground thirteen miles, width 1000 feet, and depth 60 feet, we would not be understood to imply that a continuous trench of these dimensions could be dug, and out of which ore might be gotten. The irregularity of dissolution, coupled with the unintelligible nonconformability of the uncropping limestone will not permit it. Neither will every acre of land of every estate on the line of assumed width possess enough of ore to make a digging. At the same time, the overflowings, as it were, the outspreadings of ore from the more marked lines of its production, and the doublings, are all evidences favoring the probability that the quantities here arrived at, are not over-estimated.

All this, however, only deals with the ore, as ore. Converted into metal, the neutral character of that at Pine Grove produces an iron of superior quality, commanding a ready sale, and out of which C. S. PENNOCK & Co., of Coatsville, Montgomery county, make their superior boiler plate. And of the Mont Alto iron, Mr. LESLEY says, "tested at Washington with three other varieties of iron, it stood as follows:

Tredegar iron sustained			32,000	pounds.
Ulster	"	"	32,000	"
Glendon	"	"	34,000	"
Mont Alto	"	"	34,000	"

the test bar being round, and its section equal to a square of three-quarters of an inch."

Within the past twelve months upwards of 600,000 tons of iron, pigs and rails, have been imported from England.

With the ore resources of this country, so vast and so accessible, the facilities for mining and digging it of the easiest character, and iron making one of the most profitable industries in which capital can be invested, one is left to wonder, after reading statistics on the subject, that with such home resources there should be such need of importation. Labor has something to do with it, but not all.

Between Carlisle and Waynesboro, on the route of which this paper treats, there are, if I mistake not, twenty-three miles of hematite ore of a good character and comparatively easy to dig.

Pine Grove, with its one furnace, has made iron for more than a century, and with its 20,000 acres of woodlands, and an inexhaustible supply, it has yet much to do. Aided by the use of anthracite and an extended and vigorous regimen, with its natural and local advantages, there is before it a largely productive and profitable future.

The average make of the furnace now in blast, taking nine months next preceding April last, was thirty-eight tons per week. Change of management, repairs, and an additional tuyere (it had but one) increased the produce to fifty-two and a half tons per week, and made the average cost of production, as exhibited in the last four months to November 11, $19 19 per ton, made out as follows:

Ore 2 9-20 tons, at $3 08 per ton	$7 55
Charcoal, 126 bushels, at 7 cents	8 40
Limestone, one-half ton	50
Labor at furnace	1 34
Preparing the ore	99
Haulage	29
Oil, &c	12
	$19 19

Here the ore is charged at the price sold for in the market, with 10 per cent. added for waste in calcining and screening. Take it at the cost of getting, namely $1 25 per ton, and credit the estate with a royalty of fifty cents per ton, the cost at the furnace for the four months given, will have been $15 92 per ton on the iron.

But anthracite coal will, sooner or later, play an important part in the iron making of this region. Delivered at $5 a ton, and charging the ore with a royalty and the cost of getting as above, add $1 25 for freightage, and the cost up to delivering into Harrisburgh will be $16 27 per ton.

Mr. J. C. FULLER, the President of the South Mountain Iron Company, attributes these favorable results to the regular treatment of the furnace in every particular, and to the manner of preparing the ore for the tunnel head. The lump ore, being from a third to one-half of that used is calcined in open heaps, and broken into pieces of about three inches cube. The small ore is put through a double screen, the upper mesh of which is a quarter of an inch square, the lower mesh less. By this means much of the sand and dirt which would otherwise go to the furnace is separated and kept out. The wash ore, also, after leaving the washer being left on the wharf to drain and dry, is then put through the same kind of screen.

The foregoing is only an example of what is done at one of the small establishments now on the route, and exhibits what might be done by others and larger ones, for which there is abundance of space. In the

* A paper presented to the American Institute of Mining Engineers at the Troy meeting by J. W. HARDEN, M. E.

location of industry the district is a desirable one, is easy of access, has good roads, and large and suitable areas for the establishment of works and the settlement of operatives. It is well watered and drained, conditions, I need hardly say, conducive to health and enjoyment, and with the already established means of supplying its home wants, as to be found at Waynesboro and other places on the route, is a district in which labor will seek to dwell.

MINING SUMMARY.

Colorado.

We copy the following letter from Professor N. P. Hill relating to

SMELTING IN COLORADO,

from the Central City *Register*.

Articles frequently appear in the papers of Central City, similar to yours of a few days ago, under the head of California Mining. Such articles so far as they exert any influence, are calculated to convey false impressions. Besides, there are persons, who, either from ignorance or designedly, are constantly making false statements about the comparative cost of treating ore in this and in other places.

It is stated in the article referred to, that in California, stamp-mill rock worth $8 per ton, and sulphurets worth $15 per ton, can be treated with profit. How are they treated? The stamp-mills in this county treat ores for $3, to $5 per ton. If it is claimed that the mills here do not save so large a proportion of the gold as they save in California, it must be remembered that saving gold when it is in combination with almost every base meta and sulphuret that is known, is a very different thing from saving gold when it exists free in a quartz matrix. The writer also says, that in this county gold and silver ores worth from $60 to $75 per ton, and rich in copper, are not available at the present time, and thinks it is a shame that such ores cannot be worked here with profit.

Ores containing gold and silver to the value of $60 per ton, in currency, and allowing (as the writer says, they are rich in copper,) that they contain 8 per cent. of copper, are worth here $36 per ton, without any cost beyond that of delivery at the smelting works. If ores worth $8 to $15 per ton, in California, can be mined and reduced with profits, and if in Colorado ores worth $36 per ton, over and above all costs of reduction, cannot be treated with profit, it would seem that the great difference between California and Colorado, was in the expense of mining, and not in the expense of reduction.

It would be instructive for those who complain of low prices of ore in Colorado, to inquire what prices are paid in other places.

The four principal smelting works for the treatment of gold and silver ores, in the United States, and outside of Colorado, are at San Francisco, Reno, Omaha and Newark.

At San Francisco, they charge from $50 to $100 (gold), per ton, for smelting gold and silver ores. I have not any printed scale of prices paid by this establishment, but derive these figures from the company's statement of returns made to persons who have sold them ore.

At Reno, according to their published scale of prices, they charge for ores assaying $80, $46 per ton; for ores assaying $100, $50 per ton; for ores assaying $200, $70 per ton; for ores assaying $500, $105.

At Omaha, they have treated but little ore, but they have recently made offers to miners in this county, to treat their ores for $100 per ton, and guaranteed 100 per cent. of the gold, and 95 per cent. of the silver.

At Newark, they charge $50 per ton for the lowest grades of ore, when they work for gold and silver, and advance with the increased richness of ore, to over $100 per ton.

I have before me the account of sales of two lots of ore from Nevada, Gilpin county, of about five tons each, which were sold in the open market in Swansea, Wales, to the highest bidder. One of these lots assayed $138, in currency, price paid $95; charge for treatment $43 per ton. The other lot assayed $170, currency; price paid $122.96, currency; charge for treatment, $47 per ton. These prices were paid for the gold and silver alone. The copper 6½ per cent. in the former case, and 10 per cent. in the latter, were paid for at the regular market rate, which, of course, gives on the copper a fair profit to the smelter. I have the statement of the purchasers of these ores, that they are the most complex of any ever offered at their works, and this will in part account for the charges for treatment, which for Swansea, are very high. In Swansea, coal suitable for smelting costs from 50 cents to $1.50 per ton, labor about 75 cents per day, and the best fire bricks, $12 per thousand.

The Boston and Colorado Smelting Co. are treating ores, of which the assay value of the gold and silver estimated in currency, is $50, $100, and $150, at a cost to the miner of $35, $40, and $45, respectively. That is, for ores which contain $50 per ton, currency value, all over $35 is paid to the seller, and for ores containing $100 per ton, also all over $40 is paid to the seller, and so on. For intermediate grades, a pro rata charge is made.

This company also pays for the copper, $1.50 for each per cent., on the dry Cornish assay, which is the assay on which all copper ores are sold.

No one who is acquainted with the facts, will deny that the ores of Colorado, are the most complex which are worked on this continent, containing as they do, mixed with the sulphurets of copper and iron, large quantities of the sulphurets of antimony, arsenic, zinc and lead, and a refactory gangue. Neither can any one deny that the actual costs of all the principal elements employed in smelting, viz: fuel, labor, fire-bricks, and iron, are more than double here what they are east of the Mississippi river, and much higher than they are in California.

It must be remembered that the charge of $35 to $45 per ton, not only covers all the first cost of smelting, including calcining, crushing, and bringing the ores to a liquid state, without the aid of foreign fluxes, and often a second calcination and melting to bring the matte to a workable condition, but also all the costs of separating and refining the metals, and all losses, which must inevitably occur, when so many different processes are employed.

The statement that ores which contain $8 to $15 per ton, can be treated in California, with profit, may be true. It is equally true, that the greater part of Colorado ore is treated at $3 to $5 per ton. But the statement that there is any place in the United States, where ores are smelted at so low a cost to the miner as in Colorado, is not true.

The above statements about the charge for smelting in other places, have been derived either from the company's printed scale of prices, or from their own reports of prices paid to the sellers of the ore. If any one doubts their accuracy, I will make this proposition, viz: If there is any place in the United States where ores, similar to the ores in this county are smelted, or treated on a large scale, in any other way, so as to realize 95 per cent. of their contents in gold, silver and copper, at a lower charge than is made by this company, I will at once, reduce our charges to the same terms. If any one thinks that low grade ores can be smelted in Colorado for less than $35 per ton, and their full value realized, where pine wood costs $5 to $6 per cord, common labor $3 per day, and skilled labor $5 to $6 per day, and fire bricks $130 per thousand, he has only to try it. He can soon be convinced by an experiment.

It is often represented, that the capacity of the Boston & Colorado smelting works are limited, and that they are now overstocked with ore. In answer to this, I will say, that this company provided a large surplus capital, which could be employed, if needed, and it was supposed when the company was organized that before this time it would employ twelve furnaces. It is now working three smelting furnaces. All that is required to double or treble the present capacity of the works, is a production of ore to justify it. When any one fails to find a market here for his ore, at the terms above stated, it will be time to represent that we are over-stocked and have ceased to buy.

THE LAKE SUPERIOR SILVER MINES.

From the Detroit *Free Press*, Nov. 26.

From Mr. SIBLEY, one of the principal owners of the Silver Islet mining property, who has just returned from that locality, a few items of interest have been obtained. That mine, which has now been worked over a year, and produced nearly one million dollars' worth of ore, shows not the least sign of giving out, but, if anything, increases in richness. About one hundred and thirty men are employed at the mine and upon the main land, and with their families constitute quite a settlement. The work will be prosecuted through the Winter, indeed, that is the favorable season of the year for it. The breakwater which was carried away three times, has now been made perfectly safe against the waves, and the coffer dam has now been made water tight with cement. No crevices have beenfound, though which the water gets into the mine, and it is clearer than most mines on the main land. The shaft has been sunk about ninety feet, and they have worked only about one hundred and fifty feet from it toward the main land. The vein extends in both directions, and is eight feet thick. The company have now steam power for hoisting, and for pumping out what little water gets into the mine, and are better prepared than ever for carrying on the work of mining on a large scale. They estimate that they can take out $100,000 worth of silver ore in a month, at a cost of $8,000. They have found the vein on the main land, and expect to develop it, but so far it does not approach in richness the rock in the Silver Islet mine. Up to this time the smelting works at Wyandotte have smelted out and sent to the mint over $400,000 of the silver from this mine.

Nevada.

Gold Hill *News* of December 2.

MINING ITEMS.

Last week the Hale & Norcross mine yielded 1,000 tons of ore. The Savage yielded 740 tons, the average assay value of which was $37 60 per ton. The Chollar-Potosi mine yielded 934 tons, the assayed value of which was $41,000. This mine shows improvement of late in its ore producing sections. A special meeting for the increase of the capital stock of the Daney Mining Company will be held on the 28th of December. The present capital stock is $480,000 in 8,000 shares. It is proposed to increase it to $2,400,000, divided into 24,000 shares.

The same of December 6.

The Crown Point mine yielded 1,978 tons of ore last week, the estimated mill value of which was $55,705 67. The 1,200-foot level is showing splendidly at present, and still better as further developed. The drift south is being run into the west casings of the vein, first skirting the ore, and assays from the rock run from $200 to $500 per ton. It is much superior to any ore found on the 1,100 level, and gives promise to show an extraordinary yield of ore and bullion. The east winze on the 1100-level is down to the 1200. The distance from the Belcher line where it intersects the 1200-level is 100 feet. The average assays from the winze go from $100 to $150 per ton. The stopes between the 1000 and 1100 levels yield their usual supply of ore, which mills from $30 to $35 per ton. The grade of the ore on the 1,000 level will mill from $25 to $30. On the 900-level there is a vast amount of low grade ore that will pay for milling and mining, and about 60 feet from the Belcher line adjoining the east casing of the vein there has been cut a body of ore seven feet in width that will mill from $35 to $40 per ton. This body increases in width going south, and on the Belcher line shows a width of 14 feet. In consequence of these improved prospects Crown Point stock is up in the market. The Belcher mine is also looking finely, with its huge body of ore as yet undeveloped as to its full extent. The west wall is not reached at the 1100-foot level, and the face of the south drift is looking well. The east cross-cut from the end of this drift shows 10 feet of fine ore, but the face is in porphyry. The stopes at this level give a fine showing ore, and the winzes below it also. The Chollar-Potosi mine only yielded 520 tons last week of the average assayed value of $36 40 per ton. The Gould & Curry shaft is now down 1,482 feet. The Daney shaft is about 500 feet deep, and a new level at that depth will shortly be started. The drift for the ledge at the 400-foot level is in 178 feet. The rock works well, with little water to contend with and good progress is consequently made in both shaft and drift.

The same of December 9.

CROWN POINT MINE.

The 1,000 1,100 and 1,200 foot levels of the Crown Point mine, south of the shaft and in the Belcher line, are now connected by winzes from one to the other, completed the first of this week. This gives a fine circulation of good air throughout that section of the mine.

BELCHER YIELD.

During the month of November 5,700 tons of ore was sent to the mills from the Belcher mine. The ore at this mine is loooking well, and assays from $70 to $100 per ton.

GOULD & CURRY.

The stock of this mine is up considerably at the present time, owing to a contest for the future control, and not to any new development in the mine itself.

MINING YIELD

Last week the Savage mine yielded 2,785 tons of ore, assaying $31 70 per ton on the average. The Kentuck is looking well, with plenty of fair grade in sight. The company shipped $6,212 82 worth of bullion last week.

From the Reese River *Reveille* of December 15.

SARATOGA MINE.

The incline is down 330 feet, the ore house full of rich

ore and the mine looking better every day. The proprietors, Messrs TUCKER, CURTIS, ROBERTS and STORY, have four men at work and are taking out an average of *four hundred dollars every day*. That is a hundred dollars a day to the man. If that isn't a wholesale "soap" factory, then examine us for insanity, or mental imbecility and general, worthless stupidity.

Three years ago this part of Lander Hill was generally and scientifically considered hopelessly worthless, but right were science didn't locate ore are the Saratoga and Lone Star mines which have been returning large quantities of the best grade for months past. Ruby ore is scattered around, looking as if sheep had been slaughtered over it. All the mines in that locality are looking well.

From the Elko *Independent*.

PENNSYLVANIA COAL MINE.

This mine is located 12½ miles north of the Orsena Station on the Central Pacific Railroad, and about 20 miles northeast from Elko. It was discovered and located about two years ago by parties who were on their way to Cope district, and whose attention was attracted to the locality where the mine was found on account of the similarity of the appearance of the Bitter Creek country where the best of coal has been found. A vein of coal four feet wide was first struck in a shaft at the depth of eight feet from the surface. Since then a tunnel has been run for 200 feet, cutting, in the space of 100 feet, five distinct veins of different width—amounting in all to 60 feet in width of coal resembling very much the best of what is known in this place as the Rocky mountain coal. The tunnel cuts the veins at no point at a greater depth then fifteen feet, as it has been run simply for the purpose of prospecting the veins and to ascertain the dip, etc., so that permanent works may be commenced. The character of the formation, layers, dip, etc., is very similar to that of the coal mines of Zwickau, in Saxony, where coal has been extracted for the last five hundred years, the overlaying stratas being conglomerated sandstone, slate, ta loose, or soapstone and coal shale. We consider that the proprietors of this mine have one of the finest prospects for coal yet found west of the Rocky Mountains.

Idaho.

From the Oywhee *Avalanche* of Dec. 2.

We have good mining news this morning. Since our last issue two rich strikes have been made in the Golden Chariot—one in the 5th level about 340 south of the shaft; the other at the bottom of the shaft in the 8th level. Last Thursday we visited the mine, and, from personal observation, found the vein, just struck in the 5th level, to be nearly two feet wide, with a pay streak from 18 to 20 inches in width, of as fine looking ore as we ever saw in the Chariot during its palmiest days. In the 8th level, the ledge is fully two feet wide, similar in character to that found in the 5th, fairly glistening with gold and silver. Under the circumstances it is reasonable to suppose that an immense body of ore exists between the 5th and 8th levels, south of the shaft. Look out for a sudden rise in Golden Chariot stock! Last Monday it sold in San Francisco at $5½, and, we understand that a private dispatch received here last night states that on Tuesday it went up to $15.

The Elmore mill is now cleaning up its run on tailings, after which it will crush a small lot of Mahogany ore taken out by Supt. MINEAR when he first came from San Francisco. When that is done the mill will then commence crushing ore from the South Oro Fino, now yielding from 15 to 17 tons per day—about 400 tons being now on the dump. Rich gold bearing ore is now being found in the shaft at the south end of the claim which is down 70 feet.

The 7th level of the Elmore mine, 75 feet north of the shaft, is now yielding a fair quality of ore. The mine is being prospected in several other places, and the late strike in the Golden Chariot will undoubtedly encourage the Elmore Company to resume sinking the main shaft.

The Minnesota shaft is now down 214 feet and Supt. MINEAR informs us that he will continue sinking it all winter. There are about 75 tons of ore at the mine which will be crushed in a few days and are expected to pay $50 per ton. The ore house is completed and everything is in excellent shape for winter working.

The Mahogany shaft is down below the 4th level, where a large tank has been constructed for the purpose of collecting the water that it may, with greater facility, be hoisted to the surface. After the shaft is well down out of the way, it is proposed to open up the 4th level and get it ready for stoping out ore by the time the shaft is down for the 5th level—all of which seems to indicate that the Mahogany will be opened in tip top shape.

We understand that the ore in the lower level of the South Chariot has been improving in quality for the last few days. MINEAR seems very confident of finding a good body of ore before going much further into the hill. In the first level the ore is rich, but the vein too small for profitable working.

Utah

OPHIR.

Correspondence of the Daily Tribune.

DECEMBER 12th, 1871.

Many abler pens than mine have given to the Salt Lake newspapers, descriptive accounts of the justly celebrated Mountain Lion Mine; but as work is constantly being done and developments pushed forward, there are of course, changes taking place that affect the appearance and worth of this wonderful ledge.

A piece of property that has such an affect on the interest of a community—nay, on the whole Territory, as the Lion Mine, should be seduously watched, and every change and characteristic minutely noticed, for the benefit of the community. Notwithstanding the fact that it is private property, there is none who will deny that its prosperity or decline affects the prosperity of all. Therefore I will give an account of a three hours investigation of this mine. In company with the Superintendent, Mr. THOMAS SMITH, I went directly to the original discovery hole to commence my observations. From this standpoint I could easily see the surface work that had to be done in order to trace out the horde that gathered in this vicinity, for the purpose of digging out a few tons of rich ore, before they could thus be driven off. From here we could trace the vein by the rich chloride ore, that is left for that purpose, to the Webster shaft, some 250 feet. On descending this shaft 70 feet, we came to the first level, where I found a well defined ledge containing first class ore, at least six feet thick; over head is a large vacant space from which the ore had been taken. The Webster shaft continues on down to a depth of 100 feet, and is run straight, regardless of the pitches and angles of the vein. We next visited the Mormon Bell shaft; on descending about 40 feet we entered a drift running northerly, which we followed to the Blue Wing shaft, No. 1; and thence to Blue Wing shaft, No. 2. On our return I minutely examined the ore vein, and from my observations I am sure that it is, not only a true fissure vein, but one that contains very rich ore. On elevating the light to the vein over head, I could plainly see the pure silver sticking to the ore, a piece of which I knocked off to transmit with this communication, that you might have ocular knowledge, on a small scale, of the wealth that I saw, and also have a nice little pocket specimen. The vein at this point seemed to pitch into the walls, or rather to widen out beyond my sight to an unknown width.

The drift I have here mentioned connecting the several shafts, was run on the course, and following the vein, to trace out as many locators, and since this feat has been accomplished the proprietors of the Lion mine have not been annoyed by outside locators. The Blue Wing shaft No. 2, is at a depth of 80 feet, showing a good vein of yellow chloride ore; at present the shaft is being used as the main channel for perpendicular developments. Sinking is rapidly being pushed forward, following the vein. The dumps accumulated from this shaft, show some exceedingly rich ore.

Large quantities of ore have been shipped in various directions, several parties made little fortunes out of the "Lion" before they could be traced out. The true character of this ledge enabled the owners to run directly for the interlopers, thereby spoiling the bright hopes of several, and cutting them off with but a few hundred pounds of the precious stuff. At present the mine is only taking out ore to pay expenses, leaving that which is already exposed, until the facilities of shipping it off the hill is improved.

I am under many obligations to Messrs. BATES & CLARK the proprietors, for the privilege extended me of examining one of the richest mines it has ever been my fortune to see. Also to Mr. THOMAS SMITH, superintendent, and the men connected with the mine, for their politeness and aid in my researches. The rough exterior appearance of the mine, incidental to the tracing out of interlopers, is gradually disappearing, and in a reasonable length of time the marks of strife, which now strike the stranger with wonder, will have disappeared.

Before leaving Lion Hill, I paid a short visit to the Silver Exchange, situated just below the above described mine. I found a tunnel forty feet long, tapping this mine at right angles. A shaft at the end of the tunnel following the rim down to a depth of sixty feet, and a drift thirty feet each way on the course of the vein, showing a crevice of ore matter from three to four feet wide, that, I am told, will sample from three to five hundred dollars. There is about 50 tons of high grade ore on the dumps awaiting shipment. Mr. MILLS is the efficient foreman, and Mr. DASCH, of Ophir City, superintendent ad interim. The mine ranks among the first in Ophir District.

California.

AMADOR COUNTY.

The *Ledger* states that the strike recently made in the placer diggings near Dayton, bids fair to be remunerative and lasting. The same paper thinks that the successful development of the Little Amador mine is a fair illustration of what can be accomplished by energy, judicious management, and a practical knowledge of mining. Work is being vigorously prosecuted on the Paugh mine, with excellent indications.

ALPINE COUNTY.

The Alpine *Miner* says that dialogite is now found in considerable quantities in both the Silver Glance and Schenectady mines, on the Tarshish lode. It is rich in gold. Operations at the Globe mine are progressing favorably.

INYO COUNTY.

Good news is received from the Eclipse mine, owned by an English company. The shaft has reached a depth of 300 feet; width of ledge, 7 feet. The ore taken out pays an average of $25 per ton.

LASSEN COUNTY.

We learn from the *Sage Brush* that D. KEOCH, of Susanville, received $10,000 in retorted gold dust on the 22nd ult., the result of one week's run by the Providence Company's mill at Hayden Hill, in Lassen county. As the mill has but two or three stamps, the ore must have been exceedingly rich.

MARIPOSA COUNTY.

The *Gazette*, of December 8th, states that Gordon, Garvey & Co. are cutting a ditch to take the water from Chicken Gulch around the mountain to Fine's Gulch, for the purpose of working the head of the gulch, which has proved rich below. The ditch, when completed will lead the water upon new ground, which is considered sufficiently rich to justify the enterprise. Since the rain, a large number of miners, with their forty-nine adornments of blankets, boots, pipes, etc., are betaking themselves to the hills to try their luck.

NEVADA COUNTY.

During the month of November, according to the *Union*, the Hope Gravel mine took out $10,000 worth of gold. Expenses, $2,000.

The Grass Valley *Union* has seen some fine specimens of gold-bearing quartz, taken from the Knight of Malta ledge, by Frank Caruna & Co., the proprietors. The ledge is being worked at a depth of fifty feet, and it is fully three feet in thickness, with gold visible to the naked eye. The rock is also rich in sulphurets. The Knight of Malta is directly west of the Coe mine, and is on the line of direction of the Eureka ledge.

The Declaration Quartz Mining Company have located 3,600 feet of a quartz ledge on Deadman's Flat, near the Independence tunnel, Grass Valley District.

MENDOCINO COUNTY.

The editor of the Santa Rosa *Democrat* is informed by an old citizen of Road Valley, Mendocino county, that extensive beds of coal exist in that valley. It is also stated that I. Friedlander, and others, of San Francisco, have taken up the lands upon which these coal mines exist, and have at present a force of men engaged in erecting suitable buildings for mining on an extensive scale. The coal is said to be of good quality, the quantity inexhaustible, the veins in places showing a thickness of five and six feet.

SAN DIEGO COUNTY.

New mines have been struck in the Pia Juana Valley. The quartz is silver and looks well, and the lead is about four feet wide on the surface.

Arizona.

The Prescott *Miner* of November 29th says: The mining news is meagre. In the Bradshaw District the Tiger Company is the only one now working who employ a small force in drifting in their lower levels. The new discoveries near Prescott continue to attract attention. The companies formed in Prescott have sent agents to San Francisco. In the Walapai District the

camps are filling up. All reports indicate a favorable mining season in the Territory if rain is abundant.

Montana.

The Helena *Gazette* of November 20th says: J. KEATING of the Keating lode, at Keatingville, Jefferson county, brought in yesterday a piece of amalgam worth $8,143, the result of the last run.

The four stacks of the smelting works are completed, and stand above the roof of the building. We believe that everything will be ready and operations will be commenced on the first of December.

The mines in Bear and Deep gulches are doing well.

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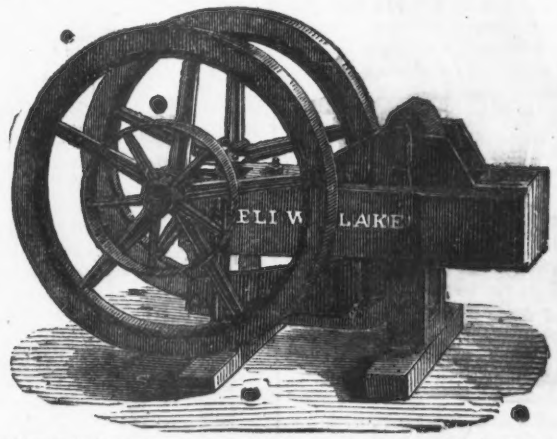

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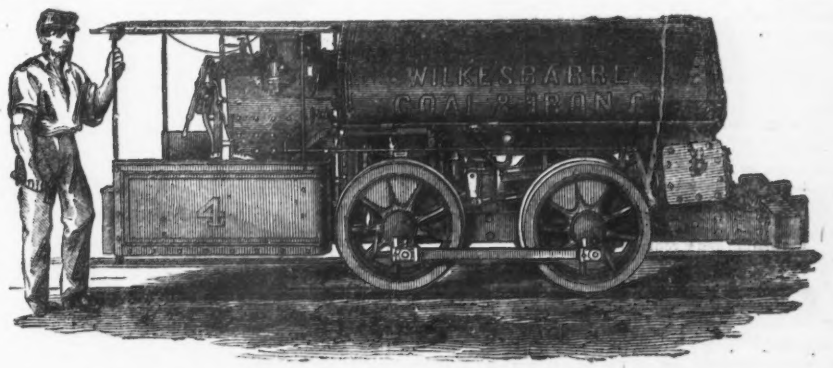

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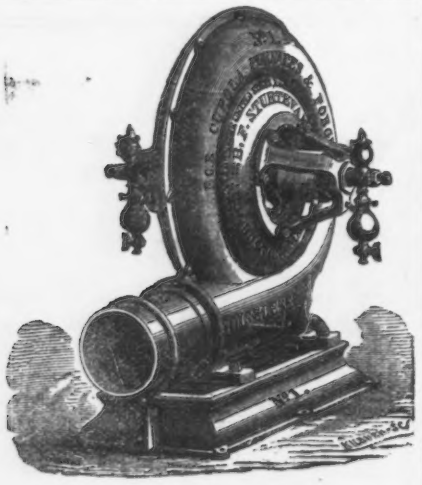

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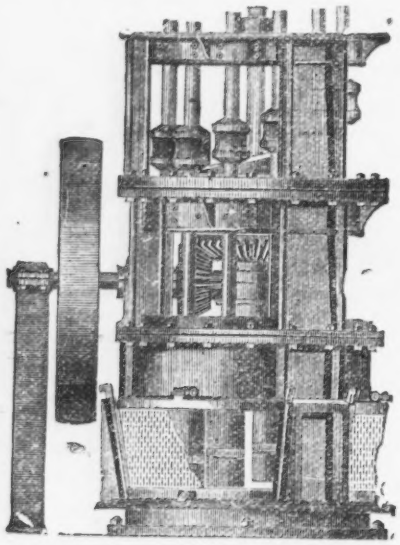

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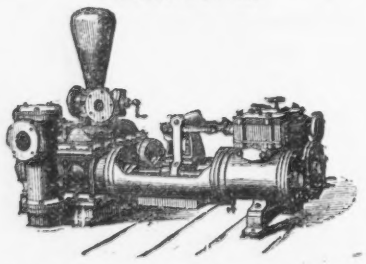

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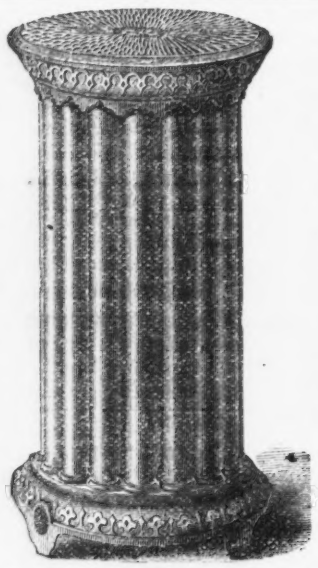

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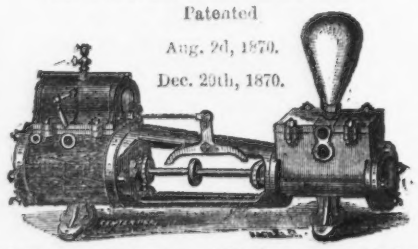

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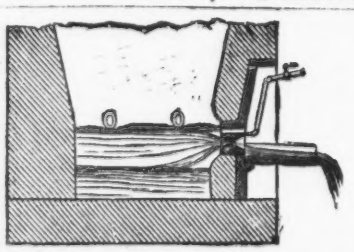

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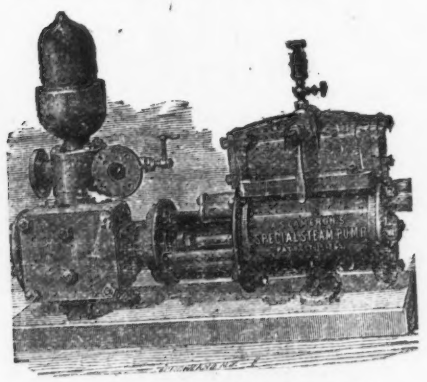

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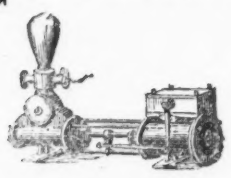

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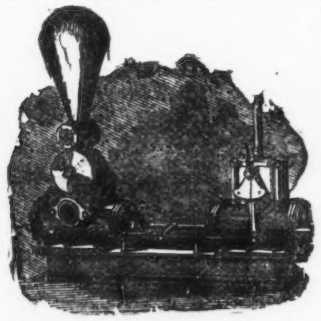

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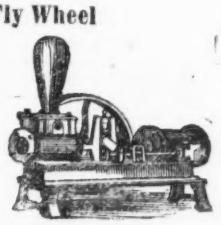

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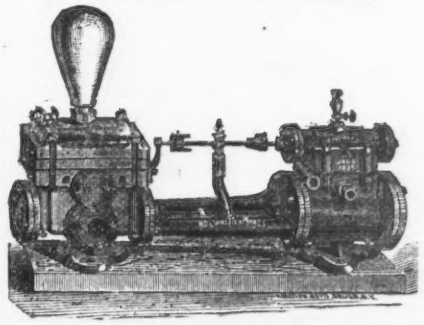

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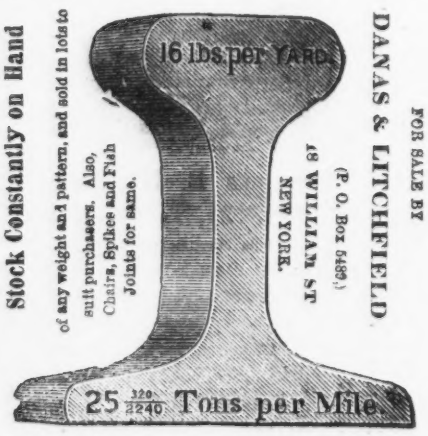
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